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ABSTRACT

This report, the first of a series of annual reports mandated by the Public Health Service Act as amended by the Health Professions Educational Assistance Act of 1976 (P.L. 94-484), describes and analyzes the status of health professions personnel in the United States. The professions covered are medicine, osteopathy, dentistry, optometry, pharmacy, podiatry, and veterinary medicine. The content is presented in ten chapters. The first overviews the trends in health manpower supply and major health manpower concerns. The next chapter describes the dynamics of health manpower supply, including geographic distribution, licensure, and education. Chapter 3 discusses major considerations in determining health manpower requirements. In separate, succeeding chapters, information is presented on the status of physicians, dentists, optometrists, pharmacists, podiatrists, and veterinarians. The information for each profession covers general and specific issues pertinent to the supply of and requirements for personnel. Focus is on professional and graduate education, student and practitioner trends and characteristics, current manpower supply, and projected manpower requirements. The last chapter briefly describes plans to develop a health professions data reporting system to meet the requirements of PL 94-484. The appendix contains detailed tables on each of the health professions covered and technical information on the sources and methodologies underlying the material presented. (EM)

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ED164867

A REPORT TO THE PRESIDENT & CONGRESS

ON THE STATUS OF HEALTH PROFESSIONS PERSONNEL

IN THE UNITED STATES

August 1978

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Health Resources Administration
Bureau of Health Manpower
Manpower Analysis Branch

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U.S. DEPARTMENT OF HEALTH,
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PREFACE

On October 12, 1976, the Health Professions Educational Assistance Act of 1976 was signed into law by the President. This law, PL 94-484, provided for the continuation or establishment of programs to support the education and training of qualified personnel to meet the Nation's health care needs and authorized the redirection of such programs toward improving the availability of primary care and the geographic distribution of health professions personnel. The Secretary of Health, Education, and Welfare also was directed by the law to "establish a program, including a uniform health professions data reporting system, to collect, compile, and analyze data on health professions personnel" and to "conduct or enter into contracts for the conduct of analytic and descriptive studies of the health professions, including evaluations and projections of the supply of, and requirements for, the health professions by specialty and geographic location". The Secretary was further directed to "assemble and submit to the President and Congress no later than September 1 of each year a report on the status of health professions personnel in the United States, which report shall include a description and analysis of the data collected pursuant to this Section" (Section 708 of the PHS Act as amended by P.L. 94-484). The report which follows is the first of the series of annual reports to be submitted in response to that directive.

The Health Professions Educational Assistance Act of 1976 reflects the most recent evidence of the long standing desire of Congress and the President, clearly evidenced in previous legislation, to assure the availability of the manpower needed to provide high quality health care to all Americans. The enactment and implementation of the Health Professions Educational Assistance Act of 1963, the Health Professions Educational Assistance Amendments of 1965, and the Allied Health Professions Personnel Training Act of 1966 and their successors facilitated an unprecedented expansion, modernization, and upgrading of the Nation's educational and training institutions and an accompanying sharp increase in the enrollments of health professions students to meet the Nation's needs for health manpower.

In recognition of the successful enrollment expansion and the subsequent rise in graduates, much of which is still to be realized, Federal concern shifted from the problems of achieving aggregate numerical adequacy of manpower nationally to the problems of improving geographic and specialty distribution, increasing the efficiency in the delivery of services, and stabilizing the costs of the services provided. In terms of availability of practitioners, however, the realization of the Nation's goal of providing quality health care to all Americans now seems definitely achievable. This first annual report describes the progress made in recent years in expanding the number of health professions personnel and briefly outlines likely future developments in the health manpower arena, both within a framework of manpower issues that either still remain to be addressed or may soon be of consequence. As a first report, it deals generally with an overview of the status of the health professions and sets the stage for the more detailed analytical and policy-oriented reports that are planned to follow in future years.

In more specific terms, this first report presents information on the number and characteristics of persons engaged in the practice of allopathic or osteopathic medicine, dentistry, optometry, pharmacy, podiatry, and veterinary medicine, and on the students preparing to enter those fields and the institutions in which they are enrolled. Also included is a brief section on physician extenders. Information on public health and allied health personnel are not covered in this report, since information on the status of these professions will be presented in 1978 in other reports to be prepared in response to directives established in section 702 of P.L. 94-484 and section 793 of the PHS Act as amended by P.L. 94-484. Information on nursing personnel is not included in this report because that profession is covered under the Nurse Training Act and will be the subject of a later report.

In addition to the information on numbers and characteristics of personnel in the health professions specified above, this report identifies major developments that may exert significant influence on the numerical adequacy or quality of health manpower, on its geographic or specialty distribution, and on the organization and cost of services. It also indicates the data collection, statistical, or analytical activities and policy concerns on which research is currently ongoing as well as those on which further work is needed. As part of this section, a more specific description is provided of the progress made in developing a statistical system to collect, compile, and analyze the data needed to determine, evaluate, and forecast the status of the health professions.

The report was prepared in the Health Resources Administration's Bureau of Health Manpower, Dr. Daniel F. Whiteside, Director, by the Bureau's Divisions of Medicine, Dentistry, and Associated Health Professions, and its Office of Program Development. It was planned, compiled, and coordinated by the Bureau's Manpower Analysis Branch, Howard V. Stambler, Chief. Bureau staff members who contributed to the preparation of the report were: Stuart Bernstein, Roger B. Cole, Anna R. Crocker, James M. Cultice, David King, Lucy M. Kramer, Ann C. Lawlor, James S. Morrow, Wilbertine P. Philpot, and Phillip Holladay of the Manpower Analysis Branch; Robert M. Politzer, a consultant to the Manpower Analysis Branch; James N. Ake, Frank M. Holtz, Dr. Donald W. Johnson, and Dr. Preston A. Littleton Jr., Division of Dentistry, Dr. Thomas L. Louden, Director; Grace W. Madison and Dr. Nathan Watzman, Division of Associated Health Professions, Thomas D. Hatch, Director; Dr. David R. McNutt, Leticia Diaz, George J. Inada, Dr. Itzhak Jacoby, Max R. Lum, Thomas Nelson, Dr. F. Anthony Pollitt, Vicki Uchill, Division of Medicine, Dr. Robert F. Knouss, Director;

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INTRODUCTION

This report, required by Section 708(d) of the Public Health Service Act as amended by the Health Professions Educational Assistance Act of 1976 (P.L. 94-484), describes and analyzes the status of health professions personnel in the United States. As the first of a series of annual reports mandated by that legislation, this report presents significant information on the professions of medicine, osteopathy, dentistry, optometry, pharmacy, podiatry, and veterinary medicine, and identifies current developments that may have a major impact on these professions. The establishment of a uniform Health Data Reporting System, mandated by Section 708(a) of the Act, to collect, compile, and analyze data on health professions personnel, is expected to close a number of important data gaps and to permit substantial improvement in the analysis of the status of health professions personnel. The validity and reliability of subsequent conclusions and their incorporation into health manpower policy should contribute extensively to the development of a health care delivery system that is adequately responsive to the Nation's needs.

The report's opening chapter "Summary and Overview: Health Manpower Trends and Issues," presents a summary of trends in the numbers of persons who work in each of the specified health professions. The chapter also highlights major manpower policy developments and concerns and presents a preliminary analysis of possible developments in policy and their potential impact on practitioners and services.

The dynamics of health manpower supply are described in the chapter that follows. The position and role of the professions in the health industry are explored, and the interrelationships of manpower, educational and training institutions, service settings and payment mechanisms are discussed. The geographic distribution of health manpower, health manpower licensure, and the supply of health professionals and the educational pipeline are discussed in separate sections of this chapter.

In the next chapter, major considerations to be addressed in the determination of health manpower requirements are discussed. A basic consideration is the definition or delineation of the concept that the requirements are to measure (e.g. biological or medical need vs. economic demand). Other considerations include the development of applicable standards for the provision of care, quantification of the relative contributions of different types of health manpower in various settings, and an assessment of the potential impact of changes in payment mechanisms, task delegation, and organization of services. Highlights of the implications of major present and potential decisions or developments in significant areas affecting health professions personnel are also described. The developments relating to foreign medical graduates, to health care extenders, and to the establishment of health maintenance organizations are discussed, and are examples of issues whose resolution will affect the future of health manpower resources.

In separate succeeding chapters, information is presented on the status of physicians, dentists, optometrists, pharmacists, podiatrists, and veterinarians. This information is presented in an analytical context which emphasizes the general and specific issues pertinent to the supply of and requirements for personnel in each discipline. These issues, broadly speaking, cover professional and graduate education, student and practitioner trends and characteristics, including geographic and specialty distribution of practitioners, and the role of practitioners in the health care delivery system. Some perspective on the state-of-the-art with respect to current and projected supply and requirements is also provided for each discipline.

The final chapter, "Meeting the Data and Analytical Needs for Pl 94-484," contains a brief but illustrative summary of present and planned efforts to close significant gaps in the data on health professions personnel and outlines the framework within which such research efforts will be conducted.

The appendix to the report contains detailed statistical data on each of the health professions covered in the body of the report, as well as technical information on the sources and methodologies underlying the material presented.

I. SUMMARY AND OVERVIEW: HEALTH PROFESSIONAL TRENDS AND ISSUES

Beginning in the mid-1960's, increases in the number and capacity of the Nation's health professions schools was reflected in sharply rising enrollments and graduates. By the early 1970's, the expanded number of health professions students had resulted in major increases in the supply of health manpower. With a substantially expanded educational pipeline now securely in place and operating at near capacity, the years ahead will see an even more rapid expansion in the supply of health manpower, bringing the number of health professionals to unprecedented high levels and closer to meeting the Nation's health manpower needs than ever before in our history. Barring drastic reductions of the Nation's health professions educational capacity, these increases are literally "frozen" into the system.

How these increases in supply have affected and could affect quality of care, availability of primary care, improvement of health status, geographic maldistribution, the educational system and health care costs, have been and continue to be the major health manpower concerns facing the Nation. This report, the first of an annual series required by PL 94-484, not only describes the extent of these increases and their potential for ameliorating many of the Nation's health care concerns, but also raises a number of the issues that are likely to be of importance in the coming years. This section summarizes some of the manpower and health care trends and issues; which, with other concerns, are discussed in more detail later in the report.

Projections made by the Bureau of Health Manpower, HRA, show that the numbers of practitioners in the major health professions categories are slated to increase from 40 to 70 percent between 1975 and 1990. In every case, the supply increase will far exceed population growth, raising the practitioner-to-population ratios well above current levels. For example, the ratio of physicians per 100,000 population is projected to rise from about 177 per 100,000 in 1975 to 241 per 100,000 in 1990, a 37 percent increase. The corresponding growth for the dentist-population ratio is 24 percent, optometrists 20 percent, pharmacists 23 percent, and podiatrists and veterinarians 44 percent.

The magnitude of these supply increases is unprecedented in U.S. history. Consequently, the effects of a greater supply of practitioners cannot be easily and unequivocally determined by experience, and will warrant careful scrutiny.

A major and related development has been the increase in utilization of most types of health care by the population. Higher incomes, expanded insurance coverage, higher levels of education and increased awareness of health, as well as the overall quality and effectiveness of the health care delivery system itself have all contributed toward increased utilization of health services and facilities.

The close relationship between the supply of physicians and the amount of care they provide has led some people to believe that physicians themselves generate care demands. Others argue that consumer demands are restricted less in areas with more physicians and that the uneven distribution of physicians in large part reflects differences in demand for care between areas. The existence and the extent of physician-generated demand will undoubtedly be among the major health manpower issues in coming years. One of the reasons for concern is that at the same time that utilization has been increasing, the price of health care has grown more rapidly than other prices and the Nation's expenditures on health care have been expanding as a proportion of the Gross National Product.

Another major manpower concern of the 1970's has been the geographic distribution of health practitioners. In very broad geographic terms, there has been only limited progress made toward more even distribution of practitioners, despite the recent increases in the aggregate supply of health professionals. In particular, the progress in improving the practitioner supply in rural and inner city areas has been slower than was hoped for, and it appears that these problems will continue to exist for a number of years.

Although physician specialty distribution has been and continues to be an area of concern, in contrast to geographic distribution, there appears to be a clear shift toward a greater proportion of primary care physicians. This particularly will be the case if graduate medical education is further restructured along the lines that it appears to be moving, i.e., a major expansion of family practice and other primary care residencies.

The representation of all segments of the population in health professions schools and in the professions themselves has been and remains an area of concern. In all of the health professions schools, the proportion of entering students who are women has regularly increased. Programs to increase minority participation, however, have been less successful than those for women. Although strong gains occurred in the early 1970's, recent progress in the proportion of minority students has slowed in some professions.

Although of critical importance, future requirements for health professionals are not known with any degree of certainty. No current method of projecting future requirements is entirely satisfactory, and different analytical approaches often provide contradictory information. The causes of changes in the demand for health care are not fully understood in many health care sectors. Perhaps the only statement about future requirements that can be made with any confidence is that by 1990 the tremendous increases in supply of health manpower should bring requirements and supply for most health professions into closer balance than at any time in the Nation's history. No severe shortages are foreseen in any health manpower category in 1990. In a few categories the projected supply may somewhat exceed projected requirements, so that an opportunity may exist to ameliorate or eliminate some problems, including that of uneven geographic distribution. The limited preliminary estimates of future requirements presented in this report can provide some insights into what the future may hold.

While these forecasts present a general picture of what the balance of practitioner supply and requirements could be in the future, they must be viewed with caution for several reasons. One major reason is the uncertainty of the effects that a surplus of a specific type of health practitioner might have. Evidence is mixed as to whether physicians and other independent practitioners appreciably generate care demands or whether they respond to care demands. Under the former view, a sharply expanded supply could lead to higher prices and provider-generated demand, as providers attempt to maintain their incomes in the face of declining demand per provider. Under the latter view, the expansion in supply of providers as compared to demand could lead to lower prices and lower professional incomes. There is also a question about the future role of midlevel practitioners (such as physician assistants and expanded function dental auxiliaries), especially if physicians and dentists were to face lower demands for their services. Other incentives for expanded utilization of midlevel practitioners would have to be strong to induce a physician facing decreasing demands for his own services to employ these practitioners.

Beyond the general topic of aggregate supply-demand relationships, a major question remains--whether the relatively greater supply of practitioners will induce more of them to seek practices in the rural and inner city areas now underserved. Practice locations are selected on the basis of a wide variety of considerations, including financial, social, and personal; and progress is only beginning to be made in fully understanding these factors. Another important concern relating to geographic distribution of practitioners is how better to identify and measure practitioner shortages. For example, it has long been recognized that use of practitioner-population ratios as an indicator of the need for additional practitioners leaves much to be desired. A multitude of factors other than a low supply relative to an area's practitioner population appears to be at work. Substantial research efforts are needed to provide insights into the impact of such factors as health care system development reimbursement practices and policies, and the systems of provider education.

Perhaps the most recent development in the health manpower field is the increasing concern about the relationship of health manpower to increasing health care costs, particularly in the hospital sector. Here the proliferation in types and numbers of all health workers has led to a steep rise in costs. Not only are hospitals the most costly component of the health care delivery system and the component with the greatest cost increases, but they are also closely involved with health practitioner requirements. The potential combined effect of hospital cost-containment policies and vastly increased supplies of physicians could have major ramifications for the future of health professions personnel. The increased supply of physicians could dampen the rise in hospital costs if it leads to more efficient use of hospitals or to the provision of more office based care. The efficient utilization of health manpower in all settings is basic to the attainment of reasonable costs for health services.

Competition, and the possible lack of it in many areas of delivery of health care, is also a newly emerging area of concern. The Federal Trade Commission has raised many serious questions about whether extensive anti-competitive practices exist in the health care industry, with undesirable effects upon health care delivery and costs. Among the issues raised are: whether ethical codes of practitioners limit competition and raise costs; whether major health care insurors behave monopolistically, are given inappropriate advantages by State legislation, and are unduly influenced by physician interests. Although these contentions are by no means firmly established, the issues they raise are relevant to both cost-containment and manpower policy development.

Underlying all of the above developments and concerns, and, in a sense, an issue by itself, is the need for development of better information and expanded analyses in the health care field. In many instances, this need is for more complete and up-to-date descriptive statistics on the health professions. Basic descriptive statistics on many health professions are incomplete, especially those for optometry, pharmacy, podiatry, and veterinary medicine; even in medicine, and dentistry, data gaps restrict policy analysis. Geographic distribution analysis depends upon the development of sound data for counties or smaller areas. Here, the completion of the Cooperative Health Statistics System (CHSS), especially the manpower and facilities components, is critical. But until such manpower and facility data are available uniformly for all 50 States, sometime in the early 1980's, CHSS data must be supplemented from other sources.

Although descriptive data are an important component of the information needed to evaluate the status of the health professions, no less important are the analytical studies that can provide further explanation of the causes and effects of changes. This type of analysis is very complex, difficult, and time consuming, and goes far beyond the simple reporting of statistical survey results. The development of this type of information is also much more problematical, since many lines of inquiry may prove fruitless. Only with expansion of this type of detailed analysis, such as is called for in Section 706 of PL 94-484, can the causes and effects of changes in the Nation's health care delivery system be identified, and the status of the health professions fully and adequately described.

II. THE DYNAMICS OF HEALTH PRACTITIONER SUPPLY

Evaluation of the status of the Nation's health practitioner manpower must include a review of the individual professions, their education, their numbers, and their distribution. But it must also involve other perspectives, such as the practitioner's role in delivering care in a large, complex care system and the changes and trends, both past and future, within this broader context. In the first section of this report, some general approaches used to assess the status of health professions personnel, including the number and characteristics of practitioners and students, practice characteristics, and patterns of past, present, and anticipated growth in the professions are emphasized, and commonalities and differences among the individual professions are discussed. Before this, however, some significant features of the health care system and health manpower generally are described to provide a general framework for better understanding the more specific discussions that follow.

Health care is an industry and, employing about five million persons, is the third largest industry in the Nation's economy. In FY 1976, personal health care expenditures amounted to over $120 billion or about 9 percent of the Nation's gross national product. Like other industries, it has been affected by the broad changes in American society that have occurred in the thirty years since World War II. Without reflection, it is difficult to recall just how sweeping the changes have been. The population is older, more educated, and urbanized. It is employed more in the professions and service industries and its personal incomes have grown rapidly. Technology has transformed nearly all aspects of life, but particularly health care. The role of the Federal government has expanded dramatically as these changes and a multitude of others have created strains and problems throughout society and the economy. Yet, it can reasonably be said that greater strains and problems have appeared in the health care industry than elsewhere, and that more public scrutiny has been focused on this industry than most others. While many industries have adapted to the changes of the past thirty years, health care has experienced increasing numbers of serious and persistent problems and has been the object of increased government involvement and public concern.

The obvious question of why the health care system has experienced a relatively greater number of serious problems is largely unanswerable. Present knowledge falls far short of providing a conclusive understanding of the forces and interactions that have caused the health care system to be what it is today. Still, there are some differences between the health care industry and most other industries which have undoubtedly contributed to the direction and form of change taking place within health care. These are:

1. For many health professions, entry can be achieved only through a licensure process open to graduates of accredited schools or persons meeting specified State requirements. The emphasis placed on scientific and technological education in the accreditation process following the Flexner report, the extended length and high cost of professional education, and the substantial institutional resources required to establish and sustain health professions education are factors that have had the effect of limiting the expansion of enrollments in some health professions schools and consequently, the supply of health professionals. In addition, the lack of flexibility and the incompatibility of curricula in schools of the same discipline and between disciplines tends to curtail, if not eliminate, student transfers and other adjustments.

2. In health care, insurance has made the utilization of health services much less expensive to the consumer at the time of puprchase than its true costs. The true cost of health care to consumers has been obscured by major government expenditures that are largely drawn from general tax revenue and by the apparent easing of financial constraints on many consumers by third-party payment plans.

3. The service output of health care is difficult to measure and to evaluate. Although some health care is as priceless to the patient as his life and may be the only alternative to illness, pain, and disability, the desirability of some courses of treatment is uncertain to both the practitioner and the patient. The content of "necessary" and "good" health care remains largely undefined, even though substantial efforts are being made to address this issue. Furthermore, the imponderables of disease and illness and the technical complexity and high technology component of many health care services tend to make consumers relatively less knowledgeable about health care than about many other services.

4. Health care, like many service industries, is still very unconcentrated, in respect to most practitioner care, but it also has moderately organized institutional sectors which are predominantly non-profit. This means that the profit motive that exists in most industries is mixed with personal objectives and the complex objectives of non-profit institutions.

5. Health care professions have long held a unique position in the public consciousness and esteem. They have traditionally been regarded as among the most highly prestigious occupations in the Nation. The health care system has thus tended to take on an almost mystical aura of unquestionable authority. That is true of almost no other industry.

These differences contribute substantially to the difficulty of any analysis of the health care system. The assumptions and explanations used to describe other industries can only be used with great care because health care is different. Alternate theories of the causes of particular health care industry problems--such as the escalation of care costs--ascribe some of the causes to one or another of these differences, but they are awkward to distinguish. Because data on health care include no period when the supplies of health professionals were not limited in some way, it is difficult to estimate the relative impacts of the features of the health care delivery system.

These difficulties in understanding the causes of changes in the health care system present problems for the development of health manpower policy. As discussed in later chapters of this report, the supply of all types of health professions will increase substantially in future years and the extent and form of health insurance coverage will also change, probably through the initiation of some type of National health insurance

Trends in overall health manpower supply provide a particularly useful perspective for the evaluation of health professional manpower. Table II-1 presents long-term trends for all health manpower and for selected occupations. It shows that over the thirty-five year period from 1940 to 1975, the supplies of health professionals have grown more slowly than the numbers of allied health manpower. Whereas health professionals amounted to 56 percent of all health manpower in 1940, this percentage had dropped to about 34 percent by 1975. Although this trend reflects many different developments, including a shift toward greater specialization and delegation, and the development of new occupations and new roles and functions for existing occupations, it may also be partly ascribable to the constraints upon entry into these professions. Similarly, the number of persons employed in occupations categorized as non-professional has grown by 550 percent in thirty-five years--probably because of the large concentration of health services in hospitals--whereas the supply of health professionals has grown by 150 percent over this period. As physicians and other health practitioners have specialized, so too have practitioners in the allied health manpower occupations. The numbers of psychologists, respiratory therapists, and vocational rehabilitation counselors have all grown very rapidly and new health occupations appear frequently.

Two other features of Table II-1 deserve comment. First, while the greatest recent concern has been expressed over the growth of hospital costs and staffing, manpower in other health services delivery settings (e.g. medical offices, nursing homes) has shown an even greater rate of growth. Although the numbers of persons in most of these occupations are still relatively small, the rate of growth is noteworthy. Second, there appears to be a reduction in the rate of growth of most allied health manpower occupations in the 1970's. It is still too early to be sure that this represents a change in the long-term trend since this reduction could be an artifact of hospital price controls and cost concerns. However, this trend warrants future examination.

An important part of any future evaluation of the status of health practitioners should be an extensive analysis of the forces shaping health care as a whole and the changes occurring in the utilization of all types of health manpower--considerations that are closely associated with health practitioners' delivery of care and its cost. For this first Report to Congress, however, these considerations have been given only limited attention and only a brief acknowledgement is made of their importance in the delivery of health care.

The Geographic Distribution of Health Professionals

The geographic distribution of health manpower has long been an area of concern for health policy. Although the Health Professions Educational Assistance Act of 1963 was directed almost entirely toward increasing the aggregate numbers of health practitioners, problems in the distribution of health manpower were recognized even then. Since that time, concern over practitioner maldistribution has grown, particularly since the total supply of manpower was expanding markedly without much apparent improvement in its geographic distribution. Today many programs are directed toward improving practitioner distribution. However, given the past intractability of this problem and the long lead time before provisions designed to alter the distribution of professionals now in training can have an impact, it appears that even the strengthened shortage area programs and related provisions enacted in P.L. 94-484 may not produce an immediate resolution to maldistribution problems.

Describing the Distribution of Health Manpower

The distribution of health practitioners is generally described by comparing the supply of health practitioners relative to population in different parts of the country. Based on this traditional measure of health manpower supply -- the practitioner-to-population ratio -- the supplies of health practitioners seem to follow a general regional pattern. For the most part, the New England and Middle Atlantic States have the most favorable supplies and the Southern States the least favorable. An exception to this general pattern is the comparatively low supply of optometrists in the Middle Atlantic States, although the presence of large numbers of ophthalmologists within that region may explain the difference. Compared to other health professions, the West North Central and Mountain regions have very favorable veterinarian-to-human population ratios. However, these ratios are probably a direct reflection of the large number of herd animals in these sections of the country; ratios of small animal veterinarians to human populations should more closely resemble the distribution of other health professions.

Another aspect of geographic distribution is the differential between supplies in metropolitan and in non-metropolitan areas of the Nation. Metropolitan counties have much larger shares of nearly all types of health manpower than their populations would indicate. In terms of patient care M.D.'s, for example, the ratio of M.D.'s to population in metropolitan counties (149 M.D.'s per 100,000) was nearly twice as large as that in non-metropolitan counties (77 per 100,000). A smaller disparity exists for primary care M.D.'s, for which the ratio in metropolitan areas (51 per 100,000) was 46 percent higher than the ratio in non-metropolitan ones (35 per 100,000). The relative dentist supply was 65 percent higher in metropolitan counties, while four times as many podiatrists were available in metropolitan counties as in non-metropolitan ones. The two types of counties had equal ratios of optometrists to population (9 per 100,000). However, in non-metropolitan areas, there was less than one ophthalmologist for every five optometrists, while there are about three ophthalmologists for every five optometrists in metropolitan areas. Thus, non-metropolitan areas were dependent upon the same per capita number of optometrists to provide much larger proportions of their vision care. With respect to pharmacist supply, differences between metropolitan and non-metropolitan areas were relatively minor. (See Fig. 1).

Comparisons of practitioner-to-population ratios across the nine Census regions support the notion that pharmacists are the most evenly distributed of the health professionals. For pharmacy, the ratios of the best supplied region (New England) and the least supplied region (the South Atlantic) both fall within 15 percent of the national average. Podiatrists are the least evenly distributed across the regions, with the supply in the Middle Atlantic States 77 percent above the national average and in the West North Central States 74 percent below it. Comparing the ranges for two types of physician ratios, it appears that primary care physicians are slightly more evenly distributed across the Census regions than are all patient care physicians.

As indicated in discussion, traditional descriptions of the geographical distribution of different health practitioners are somewhat cumbersome for making comparisons among areas and professions. The GINI index, a statistical tool that expresses unevenness as a single number, makes it easier to make such comparisons. 1/ The GINI index value varies between zero, indicating no maldistribution, and 1.0, indicating the greatest possible maldistribution.

A comparison of State GINI indices for different health practitioners (See Table II-2) reveals some interesting contrasts among the professions. The two most unevenly distributed professions, according to the GINI data, are podiatry and dentistry. To some extent, the poor distribution of podiatrists reflects the small podiatric manpower supply, the small number of States with schools of podiatry (where podiatrists tend to practice), and licensure differences among States. In the case of dentistry, an important contributing factor is the close relationship between the demand for dental care and family income levels, with the unevenness of dentist distribution thought to reflect, in part, the unevenness of care demands and consumer income. The GINI data also support the other indications that pharmacists are the most evenly distributed type of health professional. For 1974, the GINI index of pharmacist distribution by State was only 0.063, less than half that of any other health profession.

An alternative approach for evaluating distribution differences is to determine how many distinct areas throughout the country lack minimal supplies of health manpower. Such determinations have been made on a case-by-case basis in the process of designating critical health manpower shortage areas under section 329(b) of the Public Health Service Act (for the National Health Service Corps program). During the initial four years that such designations have been made, approximately 1100 areas with a total population of about 16 million have been identified as having critical shortages of primary care physicians (generally indicating less than one primary care physician for every 4000 persons in the area); of these, about four-fourths are in rural areas and one-fifth in urban areas. Approximately 850 areas with a total population of about 13 million have been identified as having critical shortages of dentists (generally indicating fewer than one dentist for every 5,000 persons); of these, about nine-tenths are in rural areas (See Table II-3). Other shortage areas have also been designated for purposes of the loan repayment program under section 741(f) of the PHS Act (See Tables II-4, A-II-1, and A-II-2). 2/

1/ To compute the GINI index, one graphically accumulates the percentage of the total population (on the one axis) and the percentage of all practitioners of the profession (on the other axis), starting with the area of lowest practitioner-to-population ratio and going to the area of highest ratio. If the distribution were perfect, the result would be a 45 degree "line of equality." The GINI index is the ratio of the area between the actual curve and the line of equality, to the total area under the line of equality.

2/ The new legislation, P.L. 94-484, as amended, requires a number of changes in coverage, criteria and procedures used in health manpower shortage area designation. Comparable figures to those shown above are not yet available. See page II-8.

Analysis of changes in the geographic distribution of health professionals over time suggests that progress towards more equitable distributions of health manpower has been mixed. Based on the GINI index, essentially no changes can be seen in the evenness of distribution of M.D.'s and podiatrists in recent years. A substantial improvement over a four-year period, equal to about 10 percent of the base year index, was observed in the GINI index calculated for optometrists. However, the most dramatic improvement was for pharmacists, where an improvement of about 40 percent over 8 years was measured.

Causes of Maldistribution

The apparent persistence of the maldistribution problem is understandable when the factors affecting locational decisions of physician and other health manpower are considered. A major aspect of the problem appears to be the strong social, professional, and other incentives for health professionals to locate in the more prosperous sections of metropolitan areas and to avoid practice in rural and inner city areas. This situation is not particularly unique or unexpected, as other service industries are characterized by similar locational patterns. The difference, of course, is that health services are more vital to the well-being of the population than many of these other services, and that availability of high quality health care to all Americans has been enunciated as a national goal.

The location of educational and training institutions is considered an important factor. For a number of disciplines, there is a direct relationship between place of professional education and practice location. The most notable example is that of podiatrists, where the States with schools of podiatry have among the highest ratios of podiatrists-to-population. Optometrists also show a definite tendency to practice in the States where they graduated. In addition, studies indicate that locale of birth place, medical school attendance, internship and residency affect strongly the propensity for a recently trained physician to locate in a given State.

From the practitioner's personal perspective, prior attachment to an area, cultural and life-style considerations, and professional opportunities all appear to be important. For physicians, especially those in secondary and tertiary specialties, the availability of a technologically advanced hospital is significant and the opportunity to join a group practice or to work with other physicians may be factors. The presence of an employing facility can be of some importance to pharmacists. Since many practitioners have relatively high income prospects wherever the location, it may be incorrect to assume that income expectations receive much consideration. At this time, there is no strong basis for estimating the degree to which additional financial incentives might make attractive an otherwise less desirable location.

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Impact of Federal Programs

In attempting to attain a more even distribution of health manpower, current Federal programs address various of the locational factors discussed above. Loan repayment and scholarships are contingent upon agreement to serve in shortage areas which are either selected from the list of all designated areas by the applicant or are matched to his expressed preferences. Extension of health professional training opportunities to States lacking professional schools, and preceptorships which induce students to practice in rural and inner city areas, depend on the importance of prior exposure. Extension of health manpower education to rural and to inner city areas through the Area Health Education Centers and other similar programs involve the influence of professional opportunities as a locational factor.

Available information on the effect of Federal programs for improving the distribution of health manpower by providing financial incentives suggests that these efforts have had only limited success to date. A large number of health professionals have received loan repayment in return for shortage area service under section 741(f) of the Public Health Service Act (See Table A-II-2), but the significance of this must be evaluated in light of the large number of health professionals graduating from school and potentially eligible for the program and the large number eligible through Federal service (in the National Health Service Corps or the Indian Health Service) who are receiving repayment as a financial bonus. The National Health Service Corps has succeeded in placing a substantial number of primary care physicians, dentists and other health manpower within shortage areas, but has been unable to recruit enough manpower to staff all approved sites. (See Table II-5) Provisions of P.L. 94-484, including the expansion of scholarships awarded in return for obligated service, are intended to improve this record.

The changes in the criteria for designation of shortage areas which were mandated by Congress in the Health Professions Educational Assistance Act of 1976 suggest that the criteria for shortage used previously for purposes of National Health Service Corps placement, under old section 329(b) of the Public Health Service Act, were considered too conservative and narrow in scope. Revisions of these criteria (to be included in Regulations implementing the new section 332 of the PHS Act) will contain provision for identifying geographical areas, population groups, and facilities which have shortages of available manpower, and are expected to result in the identification of more designated areas than the previous section 329(b) "critical health manpower shortage area" criteria, particularly in urban areas, with larger total shortages of primary care medical and dental manpower. However, the new criteria will be more stringent than were the shortage criteria previously used for the purposes of loan cancellation and repayment under section 741(f), in an effort to more closely target resources available for that program on areas of greatest need.

Measurement Problems

At present, statistics and concepts for geographic distribution analysis are rudimentary at best. Considerably more effort is needed to understand just how uneven the distribution of health manpower is and to understand the implications of a particular distribution of manpower for the distribution of health services.

A major problem with existing measures derives from the fact that most statistics relate to administratively determined areas, such as counties and metropolitan areas, and not to true health service delivery areas. Since consumers and providers of health services are seldom constrained by these administrative boundaries, dependence upon these administrative areas for analysis can provide misleading information about the relative availability of health care to persons in different areas.

Differences in the GINI index obtained when different geographic areas are used for analysis can illustrate the impact of area definition on distribution findings. As an example, for active non-Federal M.D.'s in 1973 the GINI indices for three different levels of areas were as follows:

By State (50 States)	0.161
By Census defined State Economic Area (173 areas)	0.292
By County (3,071 Counties)	0.361

In general, smaller index values (that is, less unevenness) would be expected when making comparisons among larger geographical units.

A more accurate assessment of the geographic distribution of manpower would depend on data being available for areas defined in such a way that sources of care located within their boundaries were available to all the residents in the area and to no other. Such data are impossible to obtain from national sources. However, it is hoped that improved data will become available from the Health Systems Agencies set up by Public Law 93-641. Present dependence upon county data for national analyses limits the ability to evaluate distributional problems at a sub-county level, a major shortcoming in trying to address problems within the inner-city areas of the Nation.

In addition to this problem of area definition, recent information on the utilization of medical services has raised new doubts about the adequacy of manpower/population ratios in describing the availability of adequate health services. From both anecdotal evidence and intensive analysis of selected small areas of the Nation, it is known that a large number of areas with low practitioner-to-population ratios have serious problems obtaining adequate health care. However, similar sources indicate that areas with low ratios are not necessarily characterized by the types of access problems which are assumed to be associated with low supplies, and that problems in areas with low ratios may not necessarily be resolved by the addition of health professionals. 1/ In addition, it appears that access problems exist in significant numbers of areas and population groups for which there are good to excellent practitioner-to-population ratios.

Several recent studies of physician distribution and of various aspects of health care delivery have questioned the common perception that physicians in areas with low ratios are overworked and that populations there have difficulty obtaining care. While research findings in this area are very limited and tentative, they show that practices in areas thought to have critical shortages of primary medical care are not necessarily characterized by high productivity or long waiting times for appointments. In addition, there has been some concern because utilization of services at some National Health Service Corps sites has been lower than expected.

A recent study comparing non-metropolitan areas designated as medically underserved (under sections 1302(7) and 330(b)(3) of the Public Health Service Act), with other non-metropolitan areas showed that populations of these two groups of areas have similar perceptions regarding difficulty in traveling to care, the adequacy of care, and the excessiveness of waiting times. The populations in the areas designated as being medically underserved did have greater hospital utilization, but also equal or better utilization of certain preventive services. 2/

The underlying issue of distributional concerns is the availability and accessibility of necessary and appropriate health care services to an area's population. The studies cited above suggest that the relationship between manpower and the delivery of services must be examined further if maldistribution problems are to be resolved.

Current health manpower legislation, which contains a variety of interrelated programs for addressing various aspects of the maldistribution problem, reflects the type of broad-based approach that is needed until additional insight into the operation of the health care delivery system is obtained. Substantial progress can be made, but achieving a perfectly even distribution of health manpower, particularly providers of secondary and tertiary care, does not seem to be either a realistic or a necessary goal, and efforts to obtain a more even distribution will take time.

1/ For a brief review of this research, see Reinhardt, Uwe E; "Health Manpower Policy in the United States: Issues for Inquiry in the Next Decade," November, 1976 (mimeo).

2/ Kleinman, Joel C. and Wilson, Ronald W.; "Are 'Medically Underserved Areas' Medically Underserved?" Health Services Research, Summer, 1977, pp. 147-162.

Health Practitioner Licensure

Health practitioner licensure represents another aspect of the manpower situation that warrants continuing scrutiny. In a 1968 report to the Congress, the Department of H.E.W. stated, "Theoretically, licensure is to protect the public. In practice it is sometimes sought by a profession as a means of establishing the parameters of its discipline and its title; or it can be a method of control through State registration or practitioners, with little effort to set or enforce standards." 1/ In the intervening period, many changes have taken place in the licensure of health practitioners. Some of the more notable changes that are occurring include the centralization of licensure activities, often including health and non-health occupations in a single department; the introduction of members of other health professions and members of the general public on health practitioner State boards; expansion of the scope of practice and the degree of task delegation permitted to practitioners; and the introduction of requirements for continuing education. The number of States having selected licensure characteristics for health professionals is showed in Table II-6.

Although continuing education requirements are prevalent only in optometry, a comparison of 1975 and 1976 requirements indicates a clear trend toward this type of licensure provision in many health professions. The introduction of "consumers" or members of the general public onto State licensing boards is not widespread for any profession but is definitely increasing. In a related area, there is

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1/ Independent Practitioners under Medicine. A Report to the Congress, Department of Health, Education, and Welfare, 1968.
Some features of the degree of change in practitioner licensure and some of the differences between licensure provisions of different types of practitioners are summarized in Table II-6. Reciprocity and endorsement provisions are thought to be important in reducing possible barriers that could prevent practitioners from relocating their practices into certain states and thus reducing competition. Such provisions are much more common among states for the professions of optometry, pharmacy, podiatry, and veterinary medicine than for physicians and dentists. Likewise, the acceptance of national examinations in place of the State's written examination may reduce locational barriers to reciprocity. Here, medicine, dentistry, and pharmacy are the professions with noticeably more widespread reliance on national examinations. An important development in dentistry has been the development of regional clinical examinations. In the past, the validity of clinical dental examinations has been questioned because of some States' requirements for performance of such infrequently used procedures as gold foil restorations.

considerable variation among the professions in the inclusion on the licensing board of members of professions other than the one being licensed. For practical purposes, dentists, optometrists, pharmacists, and veterinarians are licensed entirely by members of their own professions. In contrast, podiatrists are licensed by boards limited to podiatrists in 28 states, while podiatrists are required to be a majority of the health professionals in 8 states and less than a majority in 9 others. Although over 20 states have only allopathic physicians or only osteopathic physicians on their respective State boards, a striking contrast exists in the states which have mixed health professions boards. For MD's, 22 of 23 such boards have MD's as a majority of the health professional membership whereas for DO's 26 of 27 of these boards have a majority of other professions. This appears to be almost entirely attributable to having a joint board which licenses both types of physicians and reflects the relative number of MD's and DO's.

A few other current developments in licensure are notable. One is that optometrists are given authority to dispense diagnostic drugs in 8 States, and, in one State, are also permitted use of drugs for treatment, thereby shifting the practice boundaries between optometrists and ophthalmologists. There is also a trend in licensing laws toward expressing the optometrist's responsibility for ascertaining the presence of disease and referring the patient to a physician. In pharmacy, there has been a shift in pharmacy education in the last several years toward increased preparation of the student for professional roles, with involvement of pharmacists in drug therapy and greater responsibility for drug-related decision making. While there is no present recognition in licensure statutes of the differences between pharmacists educated before and after this change, as greater proportions of practicing pharmacists have this newer form of education and seek professional roles appropriate to it, serious licensure issues could arise. Finally, in medicine, MD specialty boards have established mandatory recertification in four specialties. However, only in the specialty of Family Practice, where all specialists are recently certified, does the recertification requirement take effect prior to 1985.

Over the past few years, criticism of the restrictive aspects of licensure has increased, particularly among economists who often view such restrictions as a source of professional protections from the forces of market competition. The Federal Trade Commission is currently challenging provisions of professional associations' codes of ethics forbidding advertising and the solicitation of patients in optometry, medicine, and dentistry. Other areas of concern include possible impediments to development of new forms of health care delivery such as HMO's, the involvement of organized medicine in health insurance, and possible conflicts between physicians and insurors over control of health care delivery reimbursement. At a recent FTC conference on Competition in the Health Care Sector, economists and others recommended investigation of the impact of licensure restrictions on the supply of health care providers, including such issues as whether the private sector has contributed to placing restrictions on the number of persons entering medical (and possibly other health professions) schools, whether the private sector has taken control of medical specialty areas of practice and entry to the specialties, and whether the private sector has induced inappropriate restrictions on the scope of practice of allied health professionals.

The FTC interest in possible restraint of trade in the health care sector has caused renewed interest in questions of whether licensure and activities by health practitioners have brought about anti-competitive situations furthering the economic advantage of practitioners. While many of these questions will not be resolved for a number of years, due to the difficulties in analysis of the health care system and the limitations of existing data, they give rise to at least three issues:

1) Can the licensure process be so structured as to eliminate aspects most conducive to possible anti-competitive "occupational franchising" while still serving to provide controls on activities deleterious to the quality-of-care?

2) How can the redirection of graduate medical education be effected without bringing about a situation that unintentionally confers the benefits of limited competition on specialties where entry is limited? One aspect of this issue is whether constraint on entry into well supplied specialties is the only or even the best policy. Such constraint has the disadvantage of taking effect only over an extended period, while programs that reduced incentives to practicing in well-supplied specialties would affect both the entrants to the supply and practicing specialists and thus have more rapid impact.

3) Should the current policy of limiting entry of FMG's be carefully monitored to determine whether such contraints upon entry into the medical profession are having unintended effects in the areas of care costs and the access to care of some population groups? Because FMG's are unevenly distributed by specialty and health care sector, the curtailment of FMG entry may provide a research opportunity to measure the effects of limiting market-induced supply.

Licensure issues involve difficult questions that cannot be adequately addressed at present, and it cannot be expected that licensure issues will be easily or quickly resolved. A recent report, "Credentialing Health Manpower - July 1977" (DHEW publication No. (OS) 77-50057), calls for adoption of a number of avenues that should contribute to continued improvement in the licensure and certification of health personnel.

The Supply of Health Professionals and the Educational Pipeline

The enactment of PL 88-129, the Health Professions Educational Assistance Act of 1963, began a process that has significantly expanded the educational opportunities for interested and qualified persons to enter health professions careers and now practically guarantees a tremendous future increase in the supply of health professionals.

As a consequence, the Nation's health care system is moving into a period in which the health practitioner supply will be very different from thatof the past, reaching levels heretofore not thought possible or perhaps even desirable, at least on an aggregate national basis. Due to the limited capacity of the health professions educational system existing before passage of PL 88-129 and subsequent legislation, no body of experience now exists from which the probable impact of these greater numbers of health care providers can be confidently estimated. Some observers believe that these sharp increases in supply will have the adverse result of increasing health care costs and may cause serious problems in the health care delivery system. They base their views on the apparent inability of normal market forces to regulate health care costs, and on partial evidence suggesting that health care providers may have the capability to generate their own demands for care, some of it of questionable value. However, other factors affecting health care delivery, such as growing health insurance coverage and efforts to alleviate geographic and specialty maldistribution, may so alter the situation that market forces will operate more effectively than anticipated. Overall, there is no certainty as to how the increased supply of practitioners will affect the delivery of health care. While this uncertainty will be discussed more fully later in this report, it needs to be kept in mind when examining the impact of the expected large increases in supply.

The effects of the various health professions educational assistance acts aimed at expanding health practitioner education have been considerable. First year places in health professions educational institutions increased rapidly in the mid-and late 1960's and early 1970's. This resulted in a moderate increase in practitioner supply in the 1970's, and is expected to result in rapid and substantial increases in the 1980's The long-term trends in the number of schools and graduates are summarized in Table II-7. Although the effects of the legislation have differed between the professions, all professions have experienced a rapid expansion in educational capacity and associated increases in graduates. 1/ In medicine and dentistry,

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1/ The data for future years are the basic series forecast; for a full discussion of the methodology and assumptions see the chapters of this Report on the individual professions and the Technical Appendix.

there were substantial increases in the number of schools and graduates from 1950 to 1975. While the number of schools of optometry, pharmacy, and podiatry has not increased sharply, the numbers of graduates has, reflecting expanded capacity among existing schools. In veterinary medicine, the number of schools and graduates is expected to rise considerably between 1975 and 1990.

It is apparent that the existing demand for health professions education could provide more entrants into health professions schools and ultimately into the health professions than is currently being permitted by the capacity of present educational institutions. In recent years, the number of applicants has been from two and one-half to three times greater than the number of first year places in medical and dental schools, despite a general recognition that it is futile to apply with less than excellent credentials. Likewise, schools in the other professions have had many applicants for each first year place. In pharmacy the ratio of applicants to first year places is about 2.5 to 1, optometry 3.6 to 1, podiatry 5.6 to 1, and veterinary medicine 7.3 to 1. In medicine, large numbers of foreign medical graduates have sought to enter the U.S. medical system, and thousands of young Americans have been and are studying medicine abroad. Aspirants to the health professions see these careers as very desirable, and in the absence of educational and financial constraints, even more new practitioners would likely be added to the supply than presently envisioned.

Nevertheless, the present capacity of health professions educational institutions is large enough to permit major increases in the supplies of health practitioners to take place in future years, along with vastly improved ratios of practitioners to population. This is true even in the face of the restrictions on foreign medical graduates set in place by PL 94-484 (which will be discussed later in the chapter on physicians). Estimates of increases in the numbers of practitioners and the ratio of practitioners per 100,000 population for various recent and future years are shown in Table II-8. Again, differences in the degree of increase will exist among the various types of practitioners, but all types will experience rapid growth in the practitioner-to-population ratio between 1970 and 1990.

Briefly, the method used to develop supply projections incorporates first year enrollments and completion rates to determine projected graduates for each year. Deaths and retirement rates are also taken into account to yield the net annual change in the number of practitioners for each profession. (For M.D.s the net annual increase in foreign and Canadian medical graduates is also entered into the projection model.)

These supply forecasts are believed to be relatively reliable and reflect almost entirely what is currently in the educational pipeline. Although these represent a "most likely" level of supply, other alternate projections - both of a "high" and "low" level - show only minor differences. Generally, the differences between the "most likely" Basic Series estimates, presented here, and the alternate "High Series" and alternate "Low Series" show a range of less than 6 percent in 1990.

A central feature of these forecasts of greater supplies of health practitioners is that they are somewhat immutable or "frozen into place." The stability of the educational sector is substantial and only drastic and immediate changes in the number and capacity of health profession schools could have even a moderate effect on the supply of health professionals over the next decade. If it were considered desirable, for example, to maintain the physician-to-population ratio at the 1975 level of about 177 per 100,000, a substantial reduction in the Nation's first-year medical and osteopathic school enrollment would be required to achieve that ratio in 1990. Similar situations exist to some extent for other types of health practitioners. Since there is no proven correlation between practitioner-to-population ratios and the delivery of health services, it is obvious that this is not intended to suggest that any reduction of the Nation's educational capacity for training of health manpower is desirable. Rather it is intended only to illustrate that the supply of health practitioners is almost certain to increase much faster than the population over the next decade.

Although obtaining reliable estimates of the aggregate supply of health professionals in the coming years is of major importance in evaluating the status of health manpower in the U.S., P.L. 94-484 addresses and attempts to deal with what is increasingly being recognized as an even more crucial issue--that of specialty distribution and primary care manpower. Unfortunately, estimates of the future specialty distribution of the Nation's health manpower (especially physicians) are less certain than those of the total supply. A Graduate Medical Education Trend forecast which incorporates an extrapolation to 1980 of the 1967-74 trends in first-year residency distribution and a maintenance of that distribution in the years after 1980 is presented in Table II-9. Because of the marked rise in interest in primary care during the 1967-1974 period, this method is believed to provide a realistic forecast of the numbers of physicians in primary care specialties (i.e., general and family practice, internal medicine, and pediatrics) and other specialists in 1980 and beyond. (For further discussion, see the chapter on Medicine in this report.) In this forecast, it is estimated that 46 percent of all M.D.'s (or over 50 percent if Obstetrics/Gynecology are included) may be in primary care specialties by 1990, a substantial increase in the number of MD's in this area of specialization. 1/

In terms of the ratios of MD specialists per 100,000 population, however, even these distinct increases in the supply of primary care MD's would have only a moderate effect on the overall specialty distribution. Because of the large numbers of non-primary care

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1/ These figures are "head counts" of physicians whose major field is in primary care; they do not reflect the amount of primary care services actually provided, which is believed to be substantially less than the "head counts" in these specialties would imply.

physicians already practicing, even the large numbers of primary care physicians added from new graduate medical education programs would change the specialty mix of practicing MD's only to a moderate degree. Nevertheless, if the recent trend towards greater and greater proportions of graduates entering primary care residencies or practice continues to the levels forecast in the projection, the ratio of primary care MD's per 100,000 population could grow by 1990 to about 60 percent above the 1974 level. This would likely prove at least numerically sufficient to greatly increase access to primary care.

The increases in the supply of osteopathic physicians will also likely contribute to the increased availability of primary care physicians. While there is little basis for any firm forecast of the specialty mix of osteopathic physicians, largely because of data inadequacies, it appears that the percentage of DO's in primary care fields could increase from an estimated 60 percent currently to over 70 percent by 1990. Because of major increases in the number of osteopathic school graduates, the number of DO's in primary care fields is expected to grow from an estimated 9,000 in 1976 to more than 20,000 in 1990. While these absolute numbers are small compared to the numbers of MD's, the expansion of DO educational programs will increase the 1990 supply of physicians in primary care fields by about 10 percent above the levels that would have occurred without this expansion. Since DO's have a greater tendency than MD's to locate in non-metropolitan and rural areas, this could also have beneficial effects on the geographic distribution of primary care physicians.

With the exception of medicine, specialization is not generally an area of major concern in the health professions. In dentistry, only about one out of ten dentists is in a specialty practice and the trend toward specialization is not rapid. Although precise statistics are unavailable, there appears to be no cause for immediate concern about specialization among dentists. Specialization is similarly not a major concern in optometry, pharmacy, or podiatry. However, distinct specialties in large animal and companion animal practice exist in veterinary medicine, and there is concern over the growing preference of veterinarians for companion animal practice and the corresponding decline of interest in farm animal practice.

Another feature of the health practitioner supply is the presence of graduates of foreign schools. The principal concern over foreign medical graduates is in medicine, where their numbers have more than doubled over the last decade. (The role of foreign medical graduates is addressed in considerable detail in P.L. 94-484 and will be discussed more fully in the chapter on Medicine of this report).

Following the changes in immigration regulations in the early 1960's, the numbers of FMG's licensed to practice in the United States increased sharply, growing to the point where about one in five MD's in the U.S. in 1975 was a foreign medical graduate (excluding graduates of Canadian schools and U.S. citizens) and where nearly two out of five newly licensed MD's added to the medical profession in 1974 were graduates of foreign schools. As of January, 1977, however, the entry of foreign medical graduates became much more restricted under the provisions of PL 94-484. The specific effects of this change are discussed more fully in the Medicine chapter of this report. The overall effect could be to reduce the 1990 number of active MD's in the Nation by about 64,000, or 9 percent below the level that might otherwise have occurred. Because hospitals have been the principal employer of FMG's, the effects of more restrictive FMG entry will be most pronounced in this sector. In 1973, 40 percent of all physicians employed in short-term, general hospitals were FMG's, as were more than half of all physicians employed in State mental hospitals.

FMG's also represent very high proportions of the supply of MD's in some States and the impact of reduced numbers of FMG's will be greatest in those States. In 1973 the States with the greatest percentage of FMG's and the proportion of the number of physicians in those States who are FMG's are: New York (39.3 percent), New Jersey (34.9 percent), Illinois (33.3 percent), Rhode Island (33.2 percent), Delaware (32.5 percent), West Virginia (29.7 percent) and Ohio (27.5 percent). Similarly, the impact of the new restrictions will be more pronounced in some medical specialties than in others. The medical specialties with the greatest proportion of FMG's in 1973 and their proportions are as follows: Anesthesiology (34.9 percent FMG's), Pathology (33.9 percent), Psychiatry (24.6 percent), and Physical Medicine and Rehabiliation (37.5 percent). However, the extent to which graduates of U.S. medical schools make up for the reduced entry of foreign graduates in particular specialties will likely remain unclear until data are available for one or two years under the new conditions.

Foreign graduates constitute very small percentages of most health professions other than medicine. Although changes in licensure provisions appear to be making greater allowance for the licensure of foreign graduates in these other professions, it is not likely that the numbers of foreign graduates will become important in the near future.

Another feature of recent health professions educational assistance legislation has been an emphasis on expanding opportunities for minorities and women, or, in the case of nursing, for men. Generally, there has been a greater degree of success in fostering the entry of women into the health professions. In most health professional schools, the increase in the proportion of women is significant (as shown in Table II-10). Total enrollments in health professions schools by racial/ethnic categories are shown in Table II-11. Although progress has been made in expanding the entry of minorities into health professions schools, increases in their rate of entry have been less impressive than in the case of women, and appear in some professions to have slowed in the past year or so. Many special programs exist to foster entry of minority persons into health professions schools, but problems of prior preparation have frequently hindered the continued progress of these programs. Among minority groups, the greatest improvement has occurred in the number of American Indian students enrolled. Although the number of Blacks increased numerically for a number of years, the greatest difficulty in increasing minority enrollments has been among Blacks.

Based upon these recent changes in the enrollment of minorities and women, some changes can be expected in the future supply of these health practitioners. However, the changes will be gradual because of the relatively small proportion these new graduates comprise of the total manpower supply. In terms of sex composition, the greatest change will likely occur in pharmacy, where women may constitute 31 percent of the total active work force in 1990, assuming that recent rates of their work force participation do not change radically. While precise estimates are not possible for veterinarians, the proportion of women in the field is expected to grow from a 1970 level of about 5 percent to perhaps as much as 15 percent by 1990. The proportions of women in the other professions are expected to grow but at lesser rates.

The composition of health professions school enrollment has changed in other ways. Based on preliminary estimates from a recently completed study, it appears that the proportion of health profession students from higher income families has increased sharply in the past few years. (See Table II-12)

Other preliminary estimates from this study indicate that the average total expenses for education (tuition, books, etc.) have risen sharply for students in all health professions schools. Increases in average total personal expenses apparently have been more gradual.

These trends indicate that rising tuition costs and other factors may be limiting the opportunities for many Americans to enter health professional careers, which would be cause for serious concern. Too, minorities are generally not from higher income families, and these general effects may serve to further limit the success of programs to increase minority entry into the health professions. (More precise estimates of the changes that have taken place in the characteristics of health practitioner students and their finances will be presented in the next report).

The content of the educational curricula and method of teachings in health professions schools have also undergone steady change in the 1970's, in part due to Federal and other programs designed to spur such innovation. There has been widespread introduction of clinical training external to the school, community practice and involvement with public and preventive health, computer-assisted learning and self-paced instruction. Particularly in schools of pharmacy, optometry and dentistry, there has been a much stronger emphasis on the relation of the professional's immediate concerns to the patient's total health, and with greater interprofessional involvement and responsibility. The greatest change has been in pharmacy where the last decade has seen a marked reversal in education emphasis from one of drug product orientation to one of patient orientation. In both medicine and dentistry, there is a trend toward increasing coordination of training future practitioners with the other types of health manpower with whom they will be working.

Table II-1. Estimated number of persons employed in occupations within the health field: United States, selected years 1940 through 1975 1/

Occupation	1940	1950	1960	1970	1971	1973	1974	1975
All health workers	1,159,000	1,525,100	2,266,800	4,273,700	4,413,400	4,425,800	4,690,300	4,855,500
Health professionals	659,000	739,400	1,011,900	1,336,400	1,382,300	1,485,400	1,555,000	1,633,100
Physicians (M.D.'s)	178,600	209,000	247,300	311,200	322,000	337,000	348,900	364,500
Physicians (D.O.'s)	10,200	10,900	12,200	12,000	12,100	13,100	13,600	14,100
Dentists	75,800	79,200	91,100	102,200	103,400	107,300	109,400	112,000
Optometrists	10,500	14,800	16,100	18,400	18,700	19,300	19,600	19,900
Pharmacists	82,600	89,200	92,700	109,600	111,900	116,600	119,600	122,500
Podiatrists	6,000	6,400	7,000	7,100	7,100	7,100	7,100	7,300
Veterinarians	11,100	13,700	19,500	25,900	27,100	28,200	30,600	31,100
Registered nurses	284,200	316,200	527,000	750,000	780,000	857,000	906,000	961,000
Other health workers 2/	500,000	785,700	1,254,900	2,937,300	3,031,100	2,940,200	3,135,300	3,222,400
Administration of health services	5,000	8,600	12,000	48,500	48,400	48,200	48,200	49,000
Basic sciences in health fields	7,000	15,000	30,000	51,200	51,200	60,000	60,000	60,000
Biomedical engineering	5,000	6,000	8,000	10,800	10,800	11,500	12,000	12,500
Chiropractors	11,000	13,000	15,000	17,000	16,500	15,500	16,600	17,000
Clinical laboratory services	20,000	30,000	68,000	140,000	150,500	162,800	172,500	182,000
Dental hygienists	4,000	7,000	02,500	16,000	16,800	21,000	22,500	23,500
Dental assistants	30,000	55,200	82,500	92,500	114,000	116,000	118,000	120,000
Dental laboratory technicians	18,000	21,000	25,000	32,000	31,200	32,000	32,000	32,000
Dietetic and nutritional services	18,000	22,900	25,000	47,000	37,000	68,000	72,700	75,000
Food and drug protective services	2,000	4,000	8,000	24,100	24,100	44,400	47,900	50,000
Health education	200	600	1,000	22,500	22,500	22,700	22,700	22,900
Medical records	4,000	8,000	23,000	[illegible]	54,500	54,000	60,000	64,900
Midwifery	8,000	7,000	6,000	5,300	5,000	4,200	4,300	4,400
Licensed practical nurse	100,000	146,000	245,000	400,000	427,000	459,000	468,000	477,000
Nursing aid/orderly attendant	150,000	220,000	400,000	869,500	887,000	935,500	970,000	995,000
Occupational therapy	1,000	2,000	8,000	12,800	13,500	13,700	13,700	13,700
Opticianry	2,000	3,000	4,000	11,000	11,000	11,000	12,000	12,500
Physical therapy	3,000	4,600	9,000	24,000	24,000	24,600	26,100	27,100
Psychology	2,000	3,000	8,000	13,000	27,000	27,000	35,000	40,000
Radiologic technology	20,000	30,800	70,000	87,000	87,000	100,000	100,000	105,000
Respiratory therapy	--	1,000	2,000	11,000	11,500	11,500	18,500	20,000
Secretarial office workers in health field	70,000	120,000	170,000	287,000	287,000	287,000	287,000	290,000
Social work	4,000	6,200	11,900	29,800	29,800	33,800	38,600	40,000
Specialized rehabilitation services	500	1,000	2,000	11,300	11,300	11,100	11,800	12,300
Speech pathology and audiology	800	1,600	7,000	19,000	22,000	26,500	27,000	27,500
Vocational rehabilitation counseling	--	1,000	2,000	13,400	14,800	17,000	17,000	18,000
Emergency medical technician	--	--	--	--	--	207,000	260,000	280,000
Physicians assistant	--	--	--	--	500	1,100	2,000	4,000

1/ Estimates in this table may differ slightly from other estimates shown in this report.
2/ Includes other manpower categories not listed below.

Sources: Estimates of Health Professionals from 1965 through 1975. Bureau of Health Manpower, Manpower Analysis Branch. Estimates of other health workers 1965 to 1975. Derived from NCHS, Health Resources Statistics, PHS Pub. 1509, selected 1968 to 1975 volumes.
Estimates prior to 1965 derived from DHEW PHS, Health Manpower in the United States, April 1962.

Table II-2. Comparative summary of measures of geographic distribution for selected health occupations: various years 1966-70 and 1972-74

Occupation	Year	Gini Index Among 10 regions	Among 50 States	Among 173 OBE areas 1/	Among 509 SEA's 1/
Podiatrists:					
Total........................	1968/1974	.2604/.2581	.3256/.3225	.3552/.3510	.4037/.4038
Dentists:					
Total........................	1974	.1633	.1914	.2072	.2455
M.D.'s:					
Active non-federal...........	1970/1973	.1294/.1310	.1582/.1610	.1958/.1997	.2808/.2916
R.N.'s:					
Active.......................	1966/1972	.1315/.1223	.1573/.1477	.1758/.1572	.2068/.2000
Optometrists:					
Active.......................	1968/1972	.1071/.1009	.1535/.1377	.1638/.1495	.1858/.1730
L.P.N.'s:					
Active.......................	1967/1974	.0914/.0512	.1663/.1119	.1752/.1137	.2254/.1889
Pharmacists:					
Active.......................	1966/1974	.0815/.0395	.1079/.0630	.1281/.0812	.1723/.1229

Table II-2. Comparative summary of measures of geographic distribution for selected health occupations: various years 1966-70 and 1972-74 (cont)

Occupation	Year	Gini Index Among 3,071 counties	Among 440 Type I non-metropolitan counties 3/	Among 185 Type II non-metropolitan counties 4/
Podiatrists:				
Total........................	1968/1974	.4570/.4594	.3566/.3452	.3785/.3873
Dentists:				
Total........................	1974	.2991	.2751	.2158
M.D.'s:				
Active non-federal...........	1970/1973	.3500/.3608	.2869/.2967	.3069/.3068
R.N.'s:				
Active.......................	1966/1972	.2396/.2486	.1802/.2054	.2405/.2342
Optometrists:				
Active.......................	1968/1972	.2543/.2437	.2135/.1997	.2415/.2205
L.P.N.'s:				
Active.......................	1967/1974	.2890/.2590	.2469/.2148	.2639/.2352
Pharmacists:				
Active.......................	1966/1974	.2123/.1796	.1864/.1632	.1732/.1602

1/ Office of Business Economics (OBE), Department of Commerce.
2/ State Economic Area (SEA).
3/ Counties with 10,000-99,999 resident population.
4/ Counties with 9,999 or less resident population.

Sources: M.D. Physicians--Current 1973 active non-federal (total non-federal less inactive M.D.'s as well as 1970 M.D.'s were obtained from "Distribution of Physicians in the United States", Center for Health Services Research and Development, published by the American Medical Association in 1973 and 1970 respectively. Dentists--The 1974 active dentists were obtained from the Dental Register, The Division of Dentistry, Bureau of Health Manpower. Optometrists--Data on the number of active optometrists for 1972 are from the 1972-73 Inventory of Optometrists conducted by the American Optometric Association under contract with the Bureau of Health Manpower. Data on the number of 1968 active optometrists are from the 1968 Vision and Eye Care Manpower Survey of Optometrists, National Center for Health Statistics. L.P.N.'s--Data on the number of 1974 and 1967 active licensed practical nurses are from the 1974 and 1967 American Nurses Association Inventory of Licensed Practical Nurses respectively. Pharmacists--Data on the number of 1974 active pharmacists are from the 1973-74 Inventory of Pharmacists, conducted by the American Association of Colleges of Pharmacy under contract with the Bureau of Health Manpower. Data on the number of 1966 active pharmacists are from a survey conducted by the National Association of Boards of Pharmacy, in cooperation with the National Center for Health Statistics. State data on pharmacy is available in "Pharmacy Manpower U.S. 1966," U.S. DHEW, PHS, National Center for Health Statistics, Series 14, Number 2, August 1969. Podiatrists--Data on the number of 1974 and 1968 total podiatrists are from the unpublished State licensing lists provided by the American Podiatry Association, in cooperation with the National Center

Table II-2. Comparative summary of measures of geographic distribution for selected health occupations: various years 1966-70 and 1972-74
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for Health Statistics. R.N.'s--Data on the number of 1972 and 1966 active registered nurses are from the 1972 and 1966 Inventories of Registered Nurses conducted by the American Nurses Association. *Population*--Data on the total number of 1970 U.S. resident population are from the "1970 Census of Population, Number of Inhabitants" Volume I, U.S. Department of Commerce. Data on the total number of U.S. resident population for years between 1960 and 1970 are derived by interpolation between decennial populations. Data on the total number of U.S. resident population for 1972 are from the "U.S. Census Current Population Report," 1972. Data on the total number of U.S. resident population for 1973 and 1974 are from the "Estimates of the Population (by State) Counties and Metropolitan Areas," Federal-State Cooperative Program for Population Estimates, Bureau of Census, Series P-26, July 1, 1973 and 1974 respectively. Further documentation for the above health occupations can be obtained from "User Documentation for the Manpower Analysis Branch,Area Resource File", Manpower Analysis Branch, Office of Program Development, Bureau of Health Manpower, November 1976.

Table II-3. Number of critical health manpower shortage areas designated for purposes of National Health Service Corps placements under Section 329(b) of the PHS Act: as of September 30, 1977

Type of critical health manpower shortage	Number of designated shortage areas	Population in shortage areas	Number of practitioners to eliminate shortage (remove from list)	Number of practitioners needed to achieve target ratio 1/
Medical 2/................	1,106	16,299,889	2,322	4,348
Counties................	(733)	(9,278,041)	(1,007)	(2,001)
Sub-county areas........	(373)	(7,021,848)	(1,315)	(2,347)
Dental 3/................	854	12,767,780	1,104	2,878
Counties................	(744)	(10,733,673)	(828)	(2,270)
Sub-county areas........	(110)	(2,034,107)	(276)	(608)

3/ Using the basic criterion that more than 5,000 persons per dentist indicates shortage.

1/ 2,000:1 for medical; 2,500:1 for dental.

2/ Using the basic criterion that more than 4,000 persons per primary care physician indicates shortage. (Primary care physicians here includes those patient care physicians active in general or family practice, internal medicine, pediatrics, and obstetrics/gynecology.)

Table II-4. Number of shortage areas designated for loan repayment purposes by discipline and number of practitioners short 1/

Discipline	Number of shortage areas	Number of practitioners short
Physicians (M.D./D.O.) 2/, 3/, (1:1,500) 5/	2,187	18,261
Dentists 2/, 4/ (1:3,000)	1,639	5,953
Optometrists (1:15,000)	848	1,524
Podiatrists (1:25,000)	1,487	2,758
Pharmacists (1:4,500)	205	333
Veterinarians (1:15,000)	591	966

1/ As of September 30, 1977

2/ In addition to these areas, all Indian Health Service sites except for Albuquerque and Phoenix are also designated.

3/ Approximately 200 medical areas designated under section 329(b) do not appear in these totals but ate also eligible service areas for Loan Repayment applicants.

4/ Approximately 80 dental areas designated under section 329(b) do not appear in these totals but are also eligible service areas for Loan Repayment applicants.

5/ In applying this ratio, all active patient care physicians are counted.

Table II-5. Selected data on National Health Service Corps activities: 1971-1975

Activities	7/1/71	7/1/72	7/1/73	7/1/74	7/1/75
Total areas designated.....	16*	94*	183*	681	1,128
Medical only.............	13	86	158	475	769
Sites approved.............	20	134	240	323	465
Sites staffed..............	16	94	183	193	272
Medical only.............	13	86	158	161	230
Field strength.	20	181	330	405	551
(Physicians).............	13	150	238	242	320

* Designated prior to issuance of shortage criteria, by actual placement of personnel.

Source: National Health Service Corps, Bureau of Community Health Services, Health Services Administration.

Table II-6. Number of States having selected licensure characteristics for health professionals: 1975

Type of health professional	Reciprocity/endorsement provisions	Consumers on State board	Continuing education requirement	Full or partial acceptance of a written national examination
Physician (M.D.)....	50 1/	9	2	36
Physician (D.O.)....	50 2/	11	6	42
Dentist.............	45	7	5	30
Optometrist.........	38	14	42	19
Pharmacist..........	49	14	13	44
Podiatrist..........	43	17	24	19
Veterinarian........	44	12	18	20

1/ Eleven jurisidictions impose a practice requirement which must be met before reciprocity or endorsement is granted.

2/ Four States impose a practice requirement which must be met before license is granted.

Source: State Regulation of Health Manpower. DHEW Publication No. (HRA) 77-49.

Table II-7. Actual and projected numbers of health professions schools and graduates for selected years from 1940 to 1990, by type of practitioner

Year	Medicine M.D.	Medicine D.O.	Dentistry	Optometry	Pharmacy	Podiatry	Veterinary medicine
				Number of schools			
1950	79	6	42	10	NA	8	17
1960	86	6	47	10	76	5	18
1970	103	7	53	11	74	5	18
1975	114	9	59	12	73	5	19
1980 (projected)	721	13	60	12	72	5	24
1990 (projected)	121	13	60	13	72	6	27
				Percent			
1950	5,553	373	2,830	961	NA	476	695
1960	7,081	427	3,290	364	3,497	112	826
1970	8,367	432	3,749	445	4,747	251	1,165
1975	12,714	698	4,937	806	6,886	352	1,410
1980 (projected)	16,086	1,069	5,150	998	7,455	573	1,804
1990 (projected)	18,318	1,669	5,400	1,067	7,469	616	2,505

Table II-8. Actual and projected numbers of active health practitioners and ratios per 100,000 population for selected years from 1940 to 1990, by type of practitioner

Year	Physicians			Osteopathic	Dentists	Optometrists	Pharmacists 2/	Podiatrists	Veterinarians
	Total M.D. and D.O.	M.D.s							
		USMG 1/	FMG						
	Number of active practitioners								
1940................	188,800	178,600	NA	10,200	75,800	10,500	82,600	6,000	11,100
1950................	219,900	209,000	NA	10,900	79,200	14,800	89,200	6,400	13,700
1960................	259,500	216,300	31,000 3/	12,200	90,100	16,100	92,700	7,000	19,500
1970................	323,200	256,800	54,400	12,000	102,200	18,400	109,600	7,100	25,900
1975................	378,600	288,300	76,200	14,100	112,000	19,900	122,500	7,300	31,100
1980 (projected)...	444,000	341,900	84,400	17,700	126,200	22,000	144,300	8,700	37,500
1990 (projected)...	594,000	472,100	92,100	29,800	154,500	26,700	185,400	12,500	54,900
	Practitioners per 100,000 population 4/								
1940................	142.3	143.6	--	7.7	57.2	7.9	62.3	4.5	8.4
1950................	144.4	137.3	--	7.1	52.0	9.7	58.6	4.7	9.0
1960................	143.6	119.7	17.1	6.8	49.9	8.9	51.3	3.9	10.9
1970................	157.8	125.3	26.6	5.9	49.9	9.0	53.5	3.5	12.6
1975................	177.3	135.0	35.7	6.6	52.5	9.3	57.4	3.4	14.6
1980 (projected)...	198.8	152.9	38.0	8.0	56.8	9.9	64.6	3.9	16.9
1990 (projected)...	243.9	193.9	37.8	12.2	63.4	11.0	76.1	5.1	22.5

1/ U.S. medical graduate total includes graduates of Canadian schools.

2/ Assumes existing activity rates despite increased proportions of women pharmacists; see the Pharmacy Section for further discussion.

3/ 1963 figure.

4/ U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 704, Series II estimates and projections of total population.

Table II-9. Alternative forecasts of the distribution of M.D.'s by specialty in 1980 and 1990

Category	Actual 1974	Constant GME 1/ forecast		Trend GME 1/ forecast	
		1980	1990	1980	1990
		Numbers			
All active M.D.'s..........	349,000	426,400	564,200	426,400	564,200
M.D.'s in primary care fields 2/.	133,600	160,800	210,800	168,700	250,900
Other medical specialists.........	18,500	26,000	40,300	24,500	34,000
Surgical specialists..............	98,700	116,900	150,400	113,800	134,800
Other specialists.................	98,200	122,700	162,600	119,300	144,500
		Rate per 100,000 population 3/			
All active M.D.'s.........	164.7	191.9	231.7	192.0	231.7
M.D.'s in primary care fields 2/.	63.1	72.4	86.6	76.0	103.1
Other medical specialists........	8.8	11.7	16.6	11.1	14.0
Surgical specialists.............	46.6	52.6	61.8	51.3	55.4
Other specialists................	46.4	55.2	66.8	53.8	59.4

1/ Graduate medical education.
2/ Includes general and family practice, internal medicine, and pediatrics.
3/ U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 704, Series II.

NOTE: Subtotals may not add to totals due to independent rounding.

Table II-10. First-year enrollments in health professions schools, 1974-75 through 1976-77

Academic year	Medicine		Dentistry		Optometry		Pharmacy		Podiatry		Veterinary medicine	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
1976-77:												
Total........	15,613	100.0	5,935	100.0	Not available		8,208	100.0	650	100.0	1,856	100.0
Men.................	11,755	75.3	5,133	86.5	"		4,969	60.5	600	92.3	1,258	67.8
Women...............	3,858	24.7	802	13.5	"		3,239	39.5	50	7.7	598	32.2
1975-76:												
Total........	15,295	100.0	5,763	100.0	1,057	100.0	8,710	100.0	642	100.0	1,702	100.0
Men.................	11,648	76.2	5,056	87.7	907	85.8	5,601	64.3	604	94.1	1,198	70.4
Women...............	3,647	23.8	707	12.3	150	14.2	3,109	35.7	38	5.9 1/	504	29.6
1974-75:												
Total........	14,763	100.0	5,617	100.0	Not available		8,734	100.0	561	100.0	1,682	100.0
Men.................	11,488	77.8	4,986	88.8	"		5,910	67.7	534	95.2	1,272	75.6
Women...............	3,275	22.2	631	11.2	"		2,824	32.3	27	4.8	410	24.4

1/ Indicates estimate.

Table II-11. Total enrollments in selected health professions schools in the United States, by racial/ethnic category

Profession and academic year	Total	Racial/ethnic category 1/ Total minority	Black	American Indian	Spanish surname	Mainland Puerto Rican	Oriental	White
					Number of students			
Medicine (1976-77)	57,765	6,319 2/	3,517	186	945 3/	232	1,177	51,446
Osteopathic medicine (1975-76)	3,421	120 4/	56	14	22 5/	1	24	3,301
Dentistry (1976-77)	20,790	2,099 6/	955	64	263 5/	33	611	18,691
Optometry (1975-76)	3,888	309	83	5	55	NA	166	3,579 4/
Pharmacy (1976-77) 7/	23,465	2,089 8/	938	37	353	NA	725	21,376 9/
Podiatry (1975-76)	2,085	125	58	3	18	NA	46	1,960
Veterinary medicine (1973-74)	5,516	143	105	7	20	NA	11	5,373 4/
					Percent			
Medicine	100.0	10.9	6.1	0.3	1.6	0.4	2.0	89.1
Osteopathic medicine	100.0	3.5	1.6	0.4	0.6	12/	0.7	96.5
Dentistry	100.0	10.1	4.6	0.3	1.3	0.1	2.9	89.9
Optometry	100.0	7.9	2.1	0.1	1.4	NA	4.3	92.1
Pharmacy	100.0	8.9	4.0	0.2	1.5	NA	3.1	91.1
Podiatry	100.0	6.0	2.8	0.1	0.9	NA	2.2	94.0
Veterinary medicine	100.0	2.6	1.9	0.1	0.4	NA	0.2	97.4

1/ Minority students include Americans for only medicine, osteopathic medicine, and pharmacy; all foreign students are included with White students. For other professions, foreign minority students are included in figures for minorities.

2/ Includes 262 students from other minority groups, not shown separately.

3/ Includes Mexican Americans and Cuban Americans only.

4/ Includes 3 students of unspecified minority, not shown separately.

5/ Includes Mexican Americans only.

6/ Includes 193 students from other minority groups, not shown separately.

7/ Excludes 2 schools which did not provide information on racial/ethnic category. Includes enrollments in last 3 years only.

8/ Includes 36 students of unspecified minority, not shown separately.

9/ Includes 824 foreign students.

Sources: Datagram. Medical Student Enrollment 1976-77. Journal of Medical Education 52: 164-166, February 1977.

Unpublished data from the American Association of Colleges of Osteopathic Medicine.

American Dental Association, Council on Dental Education. Annual Report 1976-77.

Dental Education Supplement. Minority Report. Chicago, The Association, 1977.

Enrollment Report on Professional programs in Pharmacy, Fall 1976. American Association of Colleges of Pharmacy, Bethesda, Maryland.

Annual Operating Reports on Health Professions Student Loan and Scholarship programs submitted to the Bureau of Health Manpower, Health Resources Administration.

Unpublished data from the American Optometric Association, Council on Optometric Education.

Unpublished data from the American Association of Colleges of Podiatric Medicine.

Table II-12. Distribution of health professions students compared to distribution of first-time students in higher education by family income

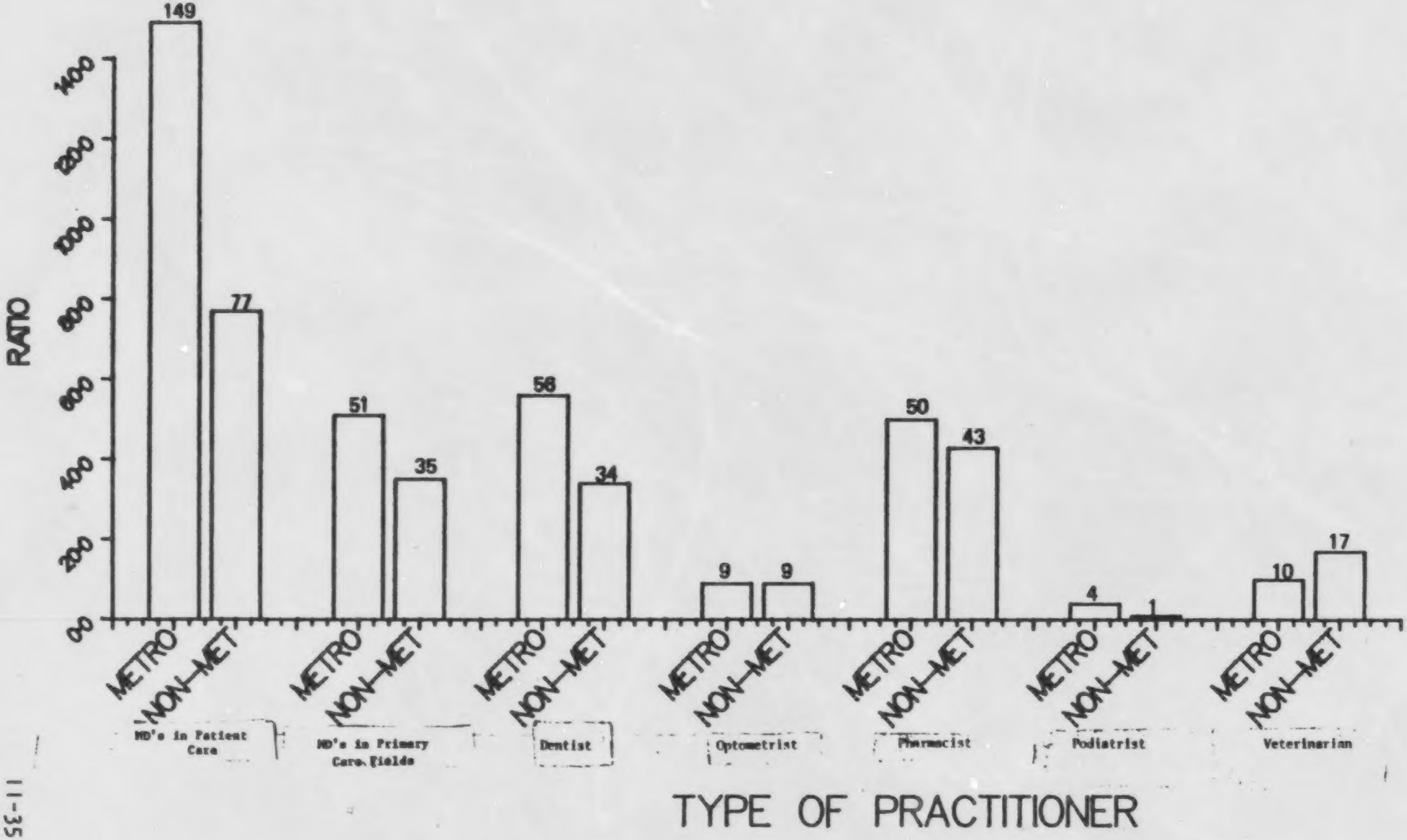
Family income	First time students in higher education Fall 1975	First time students in higher education Fall 1970	Medicine 1975	Medicine 1970	Osteopathy 1976	Osteopathy 1970	Dentistry 1976	Dentistry 1970	Optometry 1976	Optometry 1970	Pharmacy 1976	Pharmacy 1970	Podiatry 1976	Podiatry 1970	Veterinary medicine 1976	Veterinary medicine 1970
All families 1/....	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Less than $10,000..........	23	38	19	27	22	37	19	29	14	49	27	49	21	36	17	4
$10,000-$14,999............	25	21	23	25	19	28	17	30	19	27	21	29	18	28	21	3
$15,000-$19,999............	17	13	16	15	15	13	16	16	19	14	17	13	19	15	14	16
$20,000-$24,999............	13	7	41	11	14	7	18	11	21	4	15	5	18	10	17	8
$25,000-$49,999............	22	11	2/	22	19	14	21	14	20	6	17	5	17	11	21	9
$50,000 or more............	2/	2/	2/	2/	11	2/	9	2/	7	2/	4	2/	7	2/	7	2/

1/ Details may not add to totals due to independent rounding.
2/ Salaries are combined with those earning between $25,000-$49,999.

Sources: American Council on Education. National Norms for Entering College Freshmen.
Survey of How Medical Students Finance Their Education, 1974-75. DHEW Publication No. (HRA) 76-44.
Unpublished data from survey of health professions students in other than medical schools, academic year 1976-77.
Data on medical students in academic year 1975-76 from final report of contract number 231-76-0011.

FIGURE 1

RATIO OF ACTIVE PRACTITIONERS PER 100,000 POPULATION IN METROPOLITAN AND NON-METROPOLITAN COUNTIES



III. MANPOWER REQUIREMENTS AND THE DELIVERY OF CARE

Central to an understanding of future health manpower requirements is an awareness of the unique nature of the health care industry and the impact of that uniqueness of health manpower requirements estimation. In the labor market of most industries, the process of adjustment between shortages and surpluses is generally self-correcting, and seldom requires or attracts much public concern. Manpower shortages generally lead to higher incomes in the shortage occupations, the entry of greater numbers of persons into the field, and the substitution of capital equipment and other manpower types for the type in shortage. In the case of labor surplus, incomes drop; individuals seek other types of training and employment or leave the labor force; and the number of entrants into the occupation declines sharply as the occupation becomes much less attractive. While these adjustments can cause dislocation and individual hardship, in the case of both labor shortage and labor surplus, the public involvement is generally negligible.

In theory, similar processes could serve to correct a supply/requirements imbalance of health practitioners, even with the prospect of the waste of much costly education. However, great concern has been expressed about the desirability or even possibility of such self-adjustment occurring in the health field, particularly with respect to physician supply.

The two major hypotheses regarding physician supply and demand are: 1) that physicians are in a position to generate demand for their own services, so that when a potential excess of physicians indicates lower demands for care they could and would induce additional demands to the point that their incomes would not fall; and 2) that physicians do not compete in terms of price but rather set prices to the extent that lower demand per physician leads to higher costs and no significant lowering of physician incomes. The implication of both these arguments is that the market forces that operate to a large extent in other industries would not control either the quantity or the cost of physicians' services and, as a result, the total national expenditures for health care could rise indefinitely, with an increasing proportion of the gross national product being consequently devoted perhaps to either unnecessary or unnecessarily expensive health care.

The logic underlying these hypotheses about physician-generated demand rests on three generally accepted observations. First, physicians appear to build satisfactory practices relatively quickly even when they locate in apparently well supplied areas. Second, utilization of physician services is greater in areas well supplied with physicians, a fact that may be partly explained by factors such as consumer income and education, as well as physician availability. Third, the utilization of certain types of optional surgery, often thought to be of marginal utility, appears to be partly related to the availability of physicians and partly to the higher incomes and more extensive insurance coverage of the population. A fourth observation, of less direct relationship to the question of physician generated demand, is that other nations with a lesser supply of physicians have lower levels of infant and general mortality and also appear to have satisfactory physician care.

The immediate relevance of this discussion to the current and future status of the health professions, especially in the area of cost containment, relates to the critical question of whether the existence and extent of physician induced demand and physician control of prices are so pervasive in health care delivery that serious adverse effects on health care costs are resulting or likely to result. Since neither the existence nor the extent of physician control over demand and prices is clear at present, the difficult questions related to this subject must be left for later review and for future reports.

For types of health practitioners other than physicians, there appears to be much less concern about the capability of the market to correct for oversupply. In the case of dentists, consumers appear to be more sensitive to cost, and dentistry has had only limited cost increases in the past. An additional consideration is the lower rate of increase in the Nation's dentist supply, which, for many years, barely kept up with the population growth. Future supply increases are expected to be comparatively moderate, and the extensive unmet dental care needs of the population, which can be expected to lead to increased demand with the prevalence of higher consumer incomes and increased dental insurance benefits, also is a consideration. Both pharmacists and veterinarians appear to have relatively competitive markets for services, which can be expected to constrain adverse cost effects from oversupply. The lower incomes of pharmacists compared to most other practitioners could be a result of a more adequate supply and the effects of market forces, as well as the salaried nature of most pharmacy jobs. Optometrists and podiatrists to a certain extent are in a competitive situation with physicians, and market forces and the projected growth in the physician supply may also serve as effective constraints upon adverse cost or utilization effects among these professionals. However, much more research is needed before these issues can be addressed with any degree of confidence.

Problems in Estimating Manpower Requirements

Any assessment of the status of health professionals must involve more than the examination of easily understood trends and the collection of descriptive data. Rather, assessment must involve the evaluation of intricate interrelationships based upon highly technical, and often conflicting, analytical findings. Only in recent years have the difficulties of analysis and the dangers of misjudgment become clear, and only in the past few years have researchers turned to intensive examination of the health care system and its manpower. The limits of present understanding are nowhere more apparent than in the estimation of future requirements for health practitioners and the evaluation of these requirements against forecasts of future supply.

Ideally, health manpower analysis should not consider practitioner requirements or the concepts of "shortage" or "surplus" based on a static system with only one possible outcome. These concepts imply that there is only one future manpower situation that is clearly desirable and that there are no policy trade-offs between one manpower future and another. However, not only is there no single, predictable future health care system, but also one manpower configuration that can staff any sought-for health care system. In reality, there are many possible future health care systems and many different manpower paths to attain them.

The development of manpower requirements forecasts requires assumptions about factors, such as changes in the characteristics of the population, the amount and type of services demanded, the payment mechanism for services, insurance coverage, health care delivery, and practitioner productivity. In addition, a change in only one of these factors can cause changes in others. To be useful, a practitioner requirements forecast must: 1) identify in a clear and understandable manner the assumptions made and the degree of confidence that can be placed in these assumptions; 2) address the change that has occurred and will occur in the health care system; 3) express the uncertainty that is inherent in practitioner requirements forecasting; and 4) recognize, insofar as possible, that health manpower does not exist in isolation, but rather interacts with other aspects of health care.

One further feature needed to make most requirements projections useful is that they address future probability. A forecast which sets future requirements of the population's need for care without consideration of whether services can actually be provided to meet the need is incomplete. Today, there are components of the population with unmet care needs that cannot obtain care for reasons other than the availability of health practitioners. Without the removal of these other impediments (such as education, money, transportation, etc.) to obtaining care, no number of practitioners would meet these care needs. Similarly, future care needs are relevant only to the extent that they can be translated into active demands for care, which then can be met by the presence of health practitioners.

Thus, estimates of future care needs which do not permit conversion into "demand" have a more limited usefulness and can indicate mainly the upper limit of what care might be demanded if all other conditions were ideal and perhaps provide an ideal standard against which to measure progress toward the goal of providing needed care to all Americans.

Although the above considerations are crucial in developing meaningful and understandable requirements forecasts, they also tend to restrict choices as to forecasting methods. No current method is entirely satisfactory and even the best approaches rely on broad assumptions and rough approximations.

Approaches to Estimating Health Manpower Requirements

There are three general approaches to health practitioner requirements forecasting that have been most widely used. 1/ The most prevalent type has been the practitioner-to-population ratio estimate and related models. In its simplest forms, this approach takes some manpower to population ratio as its future standard and implicitly assumes that future conditions will sufficiently resemble those of the ratio standard so as to make the forecast accurate. Thus, use of an existing national, State or other sub-national ratio as a standard implies that future conditions will resemble those of the area standard selected, usually one with a "good" ratio. Use of an HMO ratio implies that the Nation's health care system either currently resembles the HMO model or will do so in the future year. Given the expectations of future change, both assumptions seem inappropriate. These approaches have the further drawbacks of not reflecting any uncertainty as to the future and failing to recognize that factors other than manpower and population enter into requirements.

Utilization models are closely related to practitioner-to-population ratio standards. The difference is that utilization models disaggregate the population into many groups relevant to provision of care, and forecast the population, utilization, and requirements for each group. In effect, such models forecast population components--age, sex, income--and maintain present practitioner population ratios for each component. While this permits the population's composition to vary, the implicit assumption is that present conditions will continue with no allowance for changes in the population's care demand or practitioners' productivity considered. A variant of this approach involves the substitution of professional judgment as to health care needs for the utilization rates for the different population components. In this approach it is assumed that future conditions will permit the provision of all needed services. The approach also has the drawback that professional judgment seldom clearly indicates all of the assumptions made so that persons other than the developers of the estimates can fully understand, evaluate, and accept these assumptions.

1/ For a more extensive discussion, see: Review of Health Manpower Population Requirements Standards: Bureau of Health Manpower/HRA, 1976: DHEW Publication No. (HRA) 77-22.

A second type of approach to forecasting practitioner requirements is based upon the projection of important trends in the past which have affected health care demands and the productivity of practitioners. Unfortunately, there is a basic conceptual problem which tends to negate this approach. Typically, past utilization is used as a proxy for past practitioner output, since no other estimate of the supply of services can be derived without complex equilibrating models. Because past utilization represents the adjustment of actual demand and supply to each other in the market context, when both of these proxies are used together, the result is essentially a projection of the past trend in the practitioner to population ratio, thereby weakening the validity of the method. Utilization cannot be used as a proxy for demand and supply. 1/ Unfortunately, many health manpower studies unintentionally contain this error.

The third type of approach to forecasting practitioner requirements consists of mathematically complex "equilibrating" models of the health care system which attempt to explain how the many forces affecting supply and demand for care came into balance or equilibrium. While this approach is theoretically far superior to other approaches, in actuality the information and theoretical understanding required by equilibrating models generally far surpass present capabilities of quantification and conceptualization. For the most part, the performance of equilibrating models has been unsatisfactory and the results unusable except to the extent that they contribute toward better equilibrating models in the future.

In summary, then, the present status of efforts to forecast health practitioner requirements is that no approach is entirely satisfactory. Nevertheless, the forecasts presented in this report can provide some preliminary insights into the future status of health professionals. In the meantime, work is proceeding on the development of improved and refined models; these will be discussed in more detail in future reports.

1/ If the trend in "demand" is estimated as the trend in utilization (UTIL) divided by the trend in population (TPOP), the "productivity" is the same utilization trend divided by the trend in providers (TPROV), the equation yielding the future provider requirement (FPROV) from these factors and the future population (POP) is:

$\mathrm{FPROV} = \mathrm{POP} * (\mathrm{UTIL}/\mathrm{TPOP})/(\mathrm{UTIL}/\mathrm{TPROV})$ which reduces and rearranges to: $\mathrm{FPROV} = \mathrm{POP} * \mathrm{TPROV}/\mathrm{TPOP}$

Requirements for Health Professionals

The basic forecasts of health practitioner requirements presented in this report are derived from a general, hybrid model of the health care system which combines elements of various approaches. The model is essentially a utilization model which also adjusts for historic trends in the delivery of care. To avoid partially the problems of trend models discussed above. Assumptions as to past price equilibration are introduced into the estimation of trends in the demand for care. Although this general model provides what appear to be reasonable forecasts, other forecasts developed in other ways are also provided in this report where applicable. A brief description of the general model is presented in Appendix B.

Although not incorporated in the requirements estimates presented in this report, the general model has the capability of examining and reflecting possible major future changes in the health care system that may depart from past experience. The three major future contingencies that will be incorporated in future estimates are: the introduction of National Health Insurance, the possible significant expansion of HMO's and other comprehensive prepaid group medical plans, and the substantial utilization of mid-level providers in care delivery.

In the following section, estimates of requirements for health professionals are presented, along with a comparison of these requirements with the supply of manpower expected to be available. More detailed estimates are also provided in the chapters that deal with those specific types of health professionals.

Requirements and Supply Relationship

As indicated earlier, for most health professions, requirements will be in rough balance with the available supply by 1990 although there may be some imbalances in aggregate numbers in one or two disciplines, and distributional problems may still exist.

For physicians (M.D.'s and D.O.'s), the future supply is projected to reach just under 600,000 physicians in 1990. Forecasts of physician requirements developed for this report indicate that aggregate national requirements may be somewhat lower, a requirement for 540-570,000 or about 5 to 10 percent fewer than are projected to be availabl~ in 1990. Because of the uncertainties involved in projecting future requirements, however, the best interpretation of these numbers is that the supply of physicians would be more than adequate to meet the Nation's needs by 1990. Although this would represent a shift from the present supply/demand situation in which shortages exist in many areas and settings, the shift should not be so great that major changes or dislocations in the nature or form of care delivery would occur. In many respects, the potential oversupply could serve as a means of alleviating current problems of geographic and specialty maldistribution, although the cost implications of such an oversupply are not clear.

For dentists, the 1990 active supply is projected to reach approximately 155,000, with active dentist requirements estimated to be approximately the same number. Based on Division of Dentistry estimates, it is concluded that the supply of dental manpower will be in balance with requirements if the output of dental schools can be maintained through the projection period.

Optometrists are forecast as having a 1990 supply of 26-27,000 and a requirement for 26,000, a rough balance. Supply and requirements for pharmacists are also forecast to be in a balance situation in 1990, with the supply of 185,000 pharmacists roughly balanced by the requirements for about 190,000 pharmacists. (However, there is some uncertainty as to whether requirements will indeed be this high.) The situation for veterinarians similarly is expected to be a rough balance, with a supply of 55,000 and requirements for about 51,000. Podiatrists will continue to be less available than most standards call for. By 1990, the supply of podiatrists is expected to be slightly over 12,000 with requirements for over 16,000.

Current analysis indicates that most of the probable future developments in health care are apt to be rather limited in their likely effect on future health manpower requirements. For example, assuming a moderate form of comprehensive National Health Insurance (15 percent coinsurance by the patient), the requirements for physicians would increase by somewhat less than 10 percent in 1980 over the above baseline forecasts because of the growth of insurance coverage already forecast without NHI. Most of the increased requirements, at least for physicians would be in the medical office sector rather than in the hospital sector. However, a very liberal form of NHI, such as a plan that called for no copayment by the patient, would cause a greater increase in requirements above the baseline. Overall, the outlook appears to be very good for continued progress toward meeting the Nation's requirements for health professions personnel.

IV. MEDICINE

The Physician's Role and Current Developments--An Overview

The physician has traditionally been the key figure in the health care system. He has the lead role in the delivery of care, whether in the hospital, or in an office-based or community setting, and has the ultimate responsibility for accurate diagnosis and beneficial treatment. The physician frequently acts in a supervisory role with regard to other health personnel, and is the focus for reimbursement under health insurance plans. Physicians also play a major role in determining national health care policy. Given the crucial role of physicians in determining national health care policy, it is essential that the numbers, location, education, training, and practice orientation of physicians be responsive to the medical needs of the population.

Access to "basic" medical services of acceptable quality varies between segments of the population because of factors such as unavailability of physicians in primary care, geographic distance, inability to pay for necessary services, long waiting times for appointments, and so on. Many people also have little or no access to the more specialized services they require because accurate diagnosis and timely referral often do not occur readily or soon enough at the primary care level. In addition, once specific specialized treatments are indicated, geographic distance and inability to afford such services can remain serious problems. Overall, access to and availability of physicians are essential to effectively meeting the needs for health services.

Although the geographic distribution of the more than 378,000 physicians in the U.S. is uneven, accessibility to the basic medical services generally provided by physicians in primary care fields (general and family practice, internal medicine, and pediatrics) is a paramount concern. Problems of accessibility and availability of the services of these physicians are most acute in rural areas and inner cities. Among physicians in primary care fields, only general and family practitioners have shown a significant inclination toward rural or non-metropolitan practice, and physician specialists in other fields generally tend to locate in urban, but not inner city areas.

The utilization of graduates of foreign medical schools (FMG's), who constitute approximately one-fifth of the Nation's physician supply, has to some extent served to meet the recent overall recent growth in demand for physicians' services, particularly in State mental institutions and in some other types of medical facilities, such as hospitals dependent on "unaffiliated" graduate medical education training positions. The newly-imposed restrictions by the Health Professions Educational Assistance Act of 1976 on the immigration of

FMG's may therefore require some adjustment in the staffing and organization of these facilities and by States that have developed a degree of dependency on FMG's to provide medical services.

Over the last 15 years the number of medical schools has increased by one-third and first-year medical school enrollment has almost doubled, while the number of colleges of osteopathic medicine increased by 50 percent and first-year enrollment more than doubled.

The number of women and persons from racial-ethnic minority groups enrolled in medical and osteopathic schools has generally increased, although a slight decrease in the enrollment of students from some minority groups has been noted recently. Anticipated increases in the overall supply of physicians, reflecting the expansion of medical and osteopathic schools and the attendant enrollment increases, and changes in the sex and racial-ethnic composition of that supply, may stimulate future improvements in the accessibility and cost-efficiency of the services of physicians and other health manpower.

The cost of physician services has been of increasing concern. Physician services, directly or indirectly, represent a major component of all health expenditures, not only in the cost of medical education, but also in terms of the income, education, and the concomitant expenditures required to provide physicians with the necessary support services. It has been estimated that a physician needs to generate approximately three times his gross annual income in drug, hospital, and other health care-related expenditures to fully effectuate his services. Thus, if the physician continue to carry the burden of health care delivery, it could mean an increasing commitment of the gross national product to the health industry. However, there are important unanswered questions about the relationship of physician supply to health care demands and health care costs, and about the implications of changes in physician supply on the physician's role, productivity, and quality of care. Many questions on the data and analysis need to be answered.

Physician Supply Characteristics and Practice Profiles

In 1975 there were an estimated 378,600 active physicians (MD's and DO's) in the United States, as compared with 288,600 in 1965, an increase of 90,000 or 31 percent. (The 1975 figure includes a BHM estimate of active not-classified M.D.'s who are excluded from the tables in this report containing trend analysis, but who are included in the tables containing projections.) Over the same decade, the supply of physicians has also increased markedly in relation to the population, rising from 148 per 100,000 to 177 per 100,000.

Projections made by the Bureau of Health Manpower (which include analysis of the effect of the Health Professions Educational Assistance Act of 1976, PL 94-484, hereafter referred to as HPEA or PL 94-484) show that the supply of physicians will continue to increase sharply over the next 15 years, both in absolute numbers and in relation to population. The ratio of active physicians (M.D. and D.O.) to population is expected to grow from 177 active physicians per 100,000 total U.S. population in 1975, to about 242 per 100,000 in 1990, to nearly 600,000 physicians. Despite the large increase, distribution problems are expected to remain, however, as reflected by the emphasis placed by PL 94-484 on programs to address the issues of specialty and geographic distribution.

Specialty and Activity Distribution of Physicians

One approach to the evaluation and understanding of physician manpower developments and concerns is to study the practice and socio-demographic characteristics of physicians currently active, as well as trends in these characteristics, such as their specialty, activity, type of practice, country of medical education, age, sex, minority representation, utilization of physician aides, and determinations of career and practice location. However, because of data limitations, many of these analyses must assume a direct one-to-one relationship between the number of professionals in a given category and the amount and type of services actually delivered by them. For example, the problems of defining and measuring "primary care" services in relation to particular specialties are indicative of the difficulty in pinpointing relationships between manpower and services. The problem of translating aggregate number of physicians into quantity and type of services provided is particularly significant in the area of primary care services, because these services are provided in some part by physicians in many other patient care specialties.

"Primary care" is an evolving concept of health services organization and provision in the United States. Unanimity of opinion on its definition is lacking, complicated by the difficulty of defining physicians in primary care fields apart from primary care services and primary care medical problems. The problem of definition is further complicated because the health care system is evolving and changing each year, with the impact of legislation, controls, policies, etc., not fully understood.

According to a widely accepted definition of primary care, 1/ the primary care physician provides the initial contact or point of entry to the health care system for the patient, assumes longitudinal responsibility for the patient regardless of the presence or absence of disease, and provides a broad integrating function vis-a-vis the

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1/ Alpert, Joel J. and Charney, Evan. The Education of Physicians for Primary Care. DHEW No. (HRA) 74-3113, USGPO, Washington, D.C., 1973.

other health resources involved in the physical, psychological, and social aspects of the patient's care. On the basis of these criteria, family and general practice are judged to satisfy completely the definition of primary care medicine, with general pediatrics and general internal medicine generally satisfying the criteria. (However, some sections of the HPEA refer to family medicine, general internal medicine, and general pediatrics as primary care specialties). HPEA does not include obstetrics/ gynecology among the primary care specialties.

The projected increase in the ratio of physicians to population does not necessarily mean the population will have greater accessibility to primary medical care. Although different types of specialists deliver varying amounts of "basic" or "primary" care, the primary care "marker" specialties as defined in Section 2 of the HPEA (i.e., general and family practice, internal medicine, and pediatrics), have been declining as a percent of all active M.D.'s for several decades, the 1976 level is about 39 percent of all active M.D.'s. (D.O.'s have shown a similar trend, as described in a later section of this chapter, though the data for D.O.'s are less conclusive than are the M.D. data.) This decline showed signs of abating beginning in 1976 and is projected to reverse itself in the 1980's, largely because of recent increases in family practice and internal medicine residencies. By 1990, the number of physicians in these primary care marker specialties may comprise as much as 44 percent of all active M.D.'s.

There are significant problems in translating available classification schemes of physicians and physician visits, (e.g., diagnoses rendered, referral status, and prior-visit status) into quantifiable measures of primary care. An on-going physician practice profile study at the University of Southern California, which is categorizing patient care as (1) first encounter, (2) episodic encounter, (3) principal care encounter, (4) consultation encounter, (5) specialized care, and (6) continuous unlimited care encounter, will facilitate understanding of the nature and quantity of primary care services actually being delivered in a large number of different specialties. Preliminary results indicate that primary care services in sizable magnitude are being delivered by non-primary care physicians. Finally, it should be noted that the primary care training of today will likely change the primary care practice and the composition of the entire physician supply in the years ahead.

Recent data indicate that the overall supply of active M.D.'s (excluding the not-classified) has increased by nearly one third in slightly over a decade, rising from 261,728 in 1963 to an estimated 348,400 in 1976. During this period, significant changes in the specialty distribution have also occurred. Table IV-1 summarizes aggregate specialty trends since 1963, while Table A-IV-1 provides a more detailed specialty distribution. As the tables show, despite a one-third increase in total supply of active M.D.'s between 1963 and

1976, there has been a sharp decline in the number of physicians in general practice. However, since data are not available separately on general practice and family practice during this period, the overall GP decline masks a significant growth in family practice during this period, which has resulted, in part, from considerable State and Federal financial support for family practice residencies since 1969.

Today, three-fourths of the Nation's medical schools have departments or divisions of family practice; there are nearly 6,000 residents in training; and 9,000 physicians have been certified by the American Board of Family Practice. Pediatricians and internists, also generally considered to be primary care physicians, have increased by two-fifths, and now represent nearly one-fourth of all active physicians. When these three specialties are combined with general practice, primary care specialists represent nearly two-fifths of the present active physician supply. However, despite the increases in the number of pediatricians and internists, (not all of whom are primary care physicians), the percentage of primary care physicians has dropped over the 13 year period, from 42.1 per cent to 39 percent of all active physicians. Nevertheless, the primary care supply has grown faster over this period than the U.S. population, and the ratio of physicians in primary care specialties per 100,000 population rose from 56.7 in 1963 to 61.9 in 1976. (See Tables IV-2, A-IV-2, and A-IV-3)

Studies have shown that relatively few new physicians locate in rural and inner city areas, where the problem of accessibility to basic medical services is most acute. Of the physicians in primary care fields, only the general practitioners (GP's), family practitioners (FP's), and osteopathic physicians (DO's) show a significant inclination toward rural or non metropolitan practice. Specialists generally tend to prefer urban practice, but not in the inner city. The 46,000 GP's comprise the largest number of active primary care physicians--46,000 in 1975--with 11,000 family practitioners and about 8,000 osteopaths. However, because of their older age distribution, active GP's exhibit an average annual rate of death and retirement loss that is almost twice that of all physicians. Current estimates indicate that about 1,500 family practice physicians are needed annually just to replace the GP's leaving the active practice of medicine. It was not until 1974, after five years of growth, that the number of family practice first-year residencies began to approximate that number, and only in 1975 was there the first relatively clear increase in the absolute number of general and family practitioners, after about two decades of continuous decline. By 1980, therefore, there may be as many general/family practitioners as there were in 1970, given continued Federal support of family practice programs. However, the 1970 supply is generally considered to have been seriously deficient.

Doctors of Osteopathy have traditionally shown a preference for rural primary care practice, but until the late 1960's only about half of the States gave full medical licenses to D.O.'s. This resulted in an uneven Region/State/County distribution of osteopathic physicians, which continues to the present. The uneven geographic distribution of these practitioners also reflects the small number of osteopathic schools and graduate training programs. However, at the present time, all States give full licensure to osteopathic physicians, and the skewed distribution may improve in the coming years.

The decline in the proportion of primary care manpower and the concomitant increase in non-primary care specialist manpower have been a source of major concern in the past. These numbers are somewhat misleading, however, since specialist manpower and specialist services are not synonymous. As indicated earlier, non-primary care physicians, particularly in the medical subspecialties and in surgery also render varying proportions of medical care similar to that rendered by primary care physicians (See Table A-IV-4). Moreover, recent research indicates that a definition of what constitutes primary care service remains elusive, with more work needed in the area of primary health care services before acceptable analyses can be performed.

The relative proportions of physicians in the separate specialties that comprise the primary care fields are not expected to change substantially by 1990. Although the remaining medical and surgical specialties will show large numerical increases, the medical specialties are expected to change little as a proportion of all physicians, and the proportion that the surgical specialties represent of all physicians may even decline. However, the ratio of both these groups to population is expected to continue to rise.

Direct patient care is the primary activity of most physicians. About two-thirds of all active physicians are in office-based practice, while about one-third are hospital-based. These proportions have remained relatively stable over the past 8 years.

Physicians engaged in medical group practice, thought by many to be a more efficient way of delivering health care than solo practice, now comprise nearly one-fifth of the active non-federal physician population, up from 12.8 percent in 1969 (See Table IV-3). There were 7,733 such groups in 1975, with an average annual growth rate of 8.4 percent since 1932. Although the growth rate has slowed in recent years, the number of physicians per group for all types of groups has continued to increase.

The utilization of physician assistants and nurse practitioners has frequently been suggested as a means of delivering basic medical care at less cost. However, existing licensure restrictions and reimbursement policies do not stimulate the use of these personnel, especially in rural areas. Midlevel health care providers and traditional auxiliaries nonetheless appear to be a potential for increasing physician's "productivity," as measured by patient visits and even the physician's net income. Group practice as opposed to solo office practice, also appears to hold potential for increasing productivity. However, past increases in the employment of auxiliary health manpower and the growth of group practices appear not to have led to consistent increases in overall physician productivity. (Physician productivity is discussed further later in this chapter.)

Available data on osteopathic physicians (D.O.'s) are much less complete than those for allopathic physicians, largely because of noncomparability of yearly data. However, between 1957 and 1976, two years for which data on D.O. specialty supply are fairly complete, the total number of non-Federal osteopathic physicians increased by almost one-half, from more than 9,600 to nearly 14,000 (See Table IV-4), somewhat more slowly than the increase in M.D.'s. At the same time, the number of D.O.'s in primary care, including general practice, internal medicine, and pediatrics, has declined from more than 90 percent of the total to slightly less than 60 percent. The surgical specialties increased significantly, rising from 4.6 percent of the total to 8.4 percent. The numbers in other specialties increased more dramatically, going from only 2.3 percent of the total to nearly 33 percent of the total.

The growing supply of doctors of osteopathic medicine (D.O.'s) should also increase the number of primary care practitioners. In 1975, there were an estimated 14,000 osteopathic physicians (as compared to 11,100 in 1965), of whom 58 percent were estimated to be involved in "primary care" activities. By 1990, the supply of D.O.'s is expected to reach nearly 30,000, with the practitioner/population ratio rising from 6.6 per 100,000 population in 1975 to 12.2 in 1990.

Foreign Medical Graduates (FMG's)

Until the Federal government began its major programs of financial support of medical education in the early 1960's, the supply of physicians had been constrained for several decades by, among other factors, the limited availability of medical school first year places and facilities; and shortages of physicians were widely believed to exist. Health manpower legislation of the mid-1960's made provision for alleviating the perceived shortages by helping expand medical and osteopathic school enrollments. Another Federal response was to give physicians occupational preference in immigration policy, resulting in the entry into the country of more than 76,000 foreign-trained physicians between 1966 and 1975, though many of these came for training only and soon returned to their countries of origin.

Graduate medical education opportunities and relatively high income potential have been cited as the principal attractions for physicians entering the United States. For many of the countries from which they came, however, they represented a significant loss not only in services but also in economic investment.

FMG's are generally heterogeneous in their geographic origins, in their level, focus, and quality of undergraduate education, and in their familiarity with the English language and American culture. Their numerical impact on the total physician supply in the U.S. can be demonstrated in a number of ways. Between 1963 and 1973, approximately 65 percent of the net increase in the physician to population ratio in the U.S. was attributable to physicians trained in foreign countries. In 1975, 35 percent of all new licenses to practice medicine issued in United States were issued to foreign medical graduates (excluding graduates of Canadian medical schools). This percentage had decreased from 44 percent in 1973. In several States, furthermore, about 40 percent of the practicing physicians have been trained abroad. Nationwide, approximately one-third of the graduate medical education positions--internships and residencies--have been filled by foreign graduates in recent years, an even higher proportion than the one-fifth that FMGs represent of the entire U.S. physician supply. (See Table IV-5).

In addition to the rapid increase in the number of FMG's in the U.S., questions were also raised about the quality of health care provided by some foreign trained physicians. Particular concerns have been expressed about their relatively poor performance in licensing and credentialling examinations and the comparability of the qualifications of U.S. and foreign trained physicians. Because of these concerns and the numerical evidence of the impact of FMG's, Congress found and declared in PL 94-484 that "there is no longer an insufficient number of physicians and surgeons in the United States such that there is no further need for affording preference to alien physicians and surgeons in admission to the United States under the Immigration and Nationality Act." 1/

As a result, it is estimated that permanent immigrant visas issued to physicians in 1977 and later years could be reduced to between 25 and 35 percent of the number issued in 1975. Most of the permanent visas issued after January 10, 1977, are likely to be issued to those FMG's with close U.S. family ties, inasmuch as an average of 33 percent of permanent immigrant visas over the past six years have been issued on the basis of family preference. (See Table IV-6).

With the use of the National Board Medical Examination (NBME) Parts I and II (or an equivalent test) as the screening examination for the Exchange Visitor Program, and with other restrictions, it is likely that the number of individuals admitted to the Exchange Visitor Program each year will also be significantly reduced. Based on an analysis of performance of FMGs on the FLEX examination (which

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1/ While the effective date of the restrictions legislated under PL 94-484 was January 10, 1973, under PL 95-483 the effective date of the restrictions on J-visa exchange visitors was postponed to January 10, 1978.

utilizes the same question bank as the National Board examination), the National Board of Medical Examiners has estimated that the expected pass rate for FMGs taking NBME Parts I and II would be approximately 15 percent.

Changes in the examination given by the Education Commission for Foreign Medical Graduates (ECFMG), which has been used as a standard for immigration preference, labor certification, and admission into graduate medical education, may also contribute to a decrease in the number of FMG's entering the U.S. The minimum acceptable score on the ECFMG English test has been increased, beginning in January 1976, to a level above that required for entrance into any other type of graduate education. As a consequence, the percent of foreign medical graduates passing the English portion dropped from about 88 percent in 1973 years to 41 percent in January 1977.

Finally, the number of graduate medical education positions available to FMG's has been decreasing. While the number of U.S. medical school graduates (USMG's) has been increasing steadily, and is expected to reach in excess of 16,000 by 1980, the number of graduate medical education (GME) positions at the entry level has not increased substantially. Thus, it can be projected that if USMG's increase at a faster rate than available GME slots, fewer postions will be available for FMG's.

These changes will likely result in a marked decline in the number of foreign physicians coming to the U.S., since a significant number of the physicians who immigrate to the U.S. were previously exchange visitors. In the future, entry may be largely limited to physicians with family ties in the U.S. or to bona fide exchange visitors.

Taking all of the above factors into account, it is estimated that between 1975 and 1990 the net gain in active FMG supply (as measured by AMA data) could be reduced by about 50 percent from previously expected levels, or from 44,000 to 22,000. The impact on physician geographic and specialty distribution which follows from this reduction has not been evaluated; however, the substantial numerical dependency upon FMG's in certain States, institutions, and even office-based market areas, implies that the reduction will not pass entirely unnoticed. In the last 20 years of FMG entry, many States (such as New York and New Jersey), and many types of medical facilities such as those dependent on "unaffiliated" graduate medical education training positions and State mental institutions), have developed a considerable dependency on FMG's to deliver medical care services to meet the needs of the specific populations they serve. Studies have shown that not only many hospital-based FMG's, but also many office-based FMG's serve certain socioeconomic population groups which otherwise might not find medical care readily available.

The restriction on immigration of FMG's may require other responses, such as the greater use of mid-level practitioners in hospital emergency rooms, designation of certain facilities as institutional shortage areas under the NHSC aegis, greater utilization of psychologists and psychiatric social workers in State mental institutions, and a substantial reorganization of the graduate medical education program. At present, however, there is no certainty as to the full effects of the changes in the Immigration and Nationality Act. To some extent, FMG's have provided a manpower "safety valve" over the past two decades whereby market forces could induce additions to the physician supply beyond those provided by graduates from the U.S. educational system.

Rising Costs of Health Care

The U.S. has seen its total bill for health expenditures grow from $25 billion in 1960 to $139 billion in 1976. During the same period, total health expenditures as a percentage of the gross national product (GNP) have risen more than 60 percent, from 5.2 to nearly 9 percent of the GNP. Moreover, the average cost of one day's stay in a hospital has increased from $16 in 1960 to $158 in 1976, almost a 1,000 percent increase. Overall, hospital costs have had the most significant impact upon medical cost increases.

The physician's role in the cost increase is difficult to assess. Explanations of overall cost increases in health care fall into two categories: those that concentrate on the demand for hospital care and those that concentrate on the supply. With regard to demand, it is thought that consumers are not generally knowledgeable about health care alternatives and their consequences, and, as a result, seek to minimize their risks of experiencing pain, discomfort, and death by demanding the maximum health services they can afford. The growth of third-party coverage of health services has contributed to the "affordability" of substantial amounts of health services. With regard to the supply reasons for the rapidly increasing hospital costs, explanations focus on the incentives which encourage physicians, administrators, and their institutions to consume increasingly larger amounts of real "input" or services. The first explanation is that under the fee-for service system, the direction is toward provision of of as many inputs as medically possible. Second, the third-party payment mechanism reinforces the incentives produced by the fee-for-service system by typically guaranteeing retrospective, cost-plus reimbursement. Third, widespread third-party coverage has meant that covered patients at the margin paid low (or zero) prices for increased hospital use. Fourth is the voluntary hospital itself where, because of the competitive market that exists among hospitals for attracting physicians to their staffs, hospitals increase their size and services and add to the sophistication of their equipment. Fifth is the process of medical education during which the trend to technical input-intensive medicine is reinforced by encouraging specialization and promoting expensive procedures. The final explanation is the medical research and development process which in the past has not tended to develop innovations that will conserve input but often had the opposite effect. Thus, physicians cannot be separated from the system in which they work in assessing the underlying dynamics of rising health care costs. However, the contribution of input-intensive physician training, research, and perspective seems noteworthy.

Quality of Care

The quality of care provided by the physician deserves specific mention. Research on quality of care focuses on three measures: structure, process, and outcome. There are few outcome measures of quality; and, therefore most research centers on "structure" or "process" measures. One "structure" type measure is whether the physician has certain credentials such as full licensure, board certification, and so on. However, State licensure requirements do not limit a physician to practice in activity areas in which he has had specific training. While the AMA lists about 36 separate medical specialties, each with its appropriate recommended graduate training requirements, physician licensure is generally unlimited in terms of services the physician is allowed to perform. About 26 medical specialties, on the other hand, have their "board" which identifies those physicians who have completed established training requirements in the specialty. Once certified, a physician may acquire hospital privileges as a specialist. Nevertheless, many specialty services can be and are performed in private offices where board certification has until recently not been fully effective. the issue of quality control standards is one of the major concerns of the Professional Standards Review Organizations (PSRO's).

Increasing Demand for Medical Services

There have been many reasons for the increased demand for medical care over the past several decades. Significant technological advances, both in diagnostic and treatment procedures, have contributed to this increase. The population has been expanding and growing older, and older population age groups exhibit higher utilization of medical services than do younger groups. The increased spread of health insurance allows people to seek treatment for medical problems which they might otherwise have ignored. Generally, the public also has exhibited an increased awareness of health care issues and problems, and has higher expectations of what health services should or can do. The increase in supply of physicians may itself have contributed to the increased demand for their services, i.e., that physicians are capable of generating their own demand to some extent, although this last point is far from resolved. The services physicians provide are frequently "input" (advice, consultation), as opposed to "output" (cures and solutions), giving them flexibility to determine the need, as they see it, for their own services, a flexibility that many other occupations in the labor force do not have. It has also been claimed by some that the organization of the U.S. health care delivery system is not as streamlined, efficient, or practical as it should be, and that multiple referrals and sometimes poor quality care contribute to over-utilization of physicians, thus increasing the demand for their time and services.

Age, Sex, and Minority Composition of Physician Supply

Slightly more than one-half of all physicians are under age 45, and there is a similarity between the age distribution of M.D.'s and D.O.'s. Over the past 7 years only slight shifts in the age distribution of physicians have taken place. Small increases have occurred among the youngest age cohorts, a result expected from the accelerated rate of increase in the number of recent medical school graduates.

A significant aspect of the physician personnel situation is the representation of minorities and women. As of 1975, minorities are estimated to comprise only about 3 percent of all active physicians, and women 8 percent. Although there has been a substantial and continuing increase in medical school enrollment of women in the recent past, the same cannot be said for minority enrollment. Although the number of minority enrollments has increased substantially, the increases have leveled off in the past two years, both in absolute numbers and as a percent of all enrollments. A small decrease from previous levels was observed in 1976. Apart from ethical, moral, and equity considerations, however, substantial increases in qualified minority and women physicians might result in many advantages to the health system, e.g., better communication and understanding between providers and consumers, deeper understanding of psycho-social aspects of medical problems, and possibly a more even geographic distribution of physicians in relation to population, though existing research has been far from conclusive on these issues.

The proportion of women in allopathic medicine has increased slowly but steadily since 1970, from 6 percent of all M.D.'s to nearly 10 percent in 1975. Women represent a much smaller percent of the osteopathic physician supply (about 6 percent) at the present time. Blacks, who comprise about 13 percent of the national population, comprise only about 3 percent of the physician supply.

Determinants of Career and Geographic Choices

In addressing geographic or specialty issues and concerns, it is important to understand the factors which predispose physicians to choose particular specialties and to practice in specific geographic locations. Numerous studies have been conducted in this field with one of the major objectives being to analyze and develop admissions criteria and supportive curricula in medical and other schools of higher learning that would direct students to choose specialties and geographic locations most in need of their services. Medical students are a relatively homogeneous group of high achievers with similar intellectual and social outlooks, and thus tend to reinforce existing patterns of physician specialty and geographic choice.

Factors gleaned from research efforts on career and geographic choice indicate that sociodemographic, medical school environment, psychological, and community variables are paramount. It appears that the community of origin and the medical specialty selected are significant predictors of probable geographic location. The research findings suggest that physicians who select small towns for general practice value life style factors to a greater extent than professional status. On the other hand, many physicians who choose to practice in an urban area appear to select specialties which depend upon modern facilities and which permit stimulation from the presence of professional colleagues. For example, medical students who appear predisposed to general practice have been characterized sociodemographically as: (1) Those who are relatively older and have larger families; (2) those whose fathers have lower status occupations; (3) those who received lower scores on their Medical College Admissions Test; (4) those who have lower income expectations; and (5) those who come from smaller sized communities. It should be noted that such comparisons are being made within a highly selective academic environment, and those students choosing general practice are high performers in clinical rotation.

Research findings also suggest that many institutional variables have an impact on the student's selection of primary care, such as: (1) faculty composition and presence of role models; (2) the nature of the curriculum; and (3) the extent to which research is emphasized by the school. However, additional research is needed to determine how the attributes of today's students and their educational experiences interact to determine specialty preferences.

Geographic Distribution of Physicians

There are many variables which bear on the health status of the U.S. population, a number of which are not related to the presence or absence of a physician (e.g., environmental, educational, psychological factors) or to the availability of other types of health manpower. However, it is generally agreed that assuring access to quality health care (at least to a first-contact physician) at a reasonable cost is a major aspect of maintaining or improving the population's health status. It is clear, too, that there is an uneven geographic distribution of physicians and physician services in the United States. As a result, many current programs are aimed at alleviating the uneven geographic distribution of physicians. These programs include the loan repayment program, the National Health Service Corps, and more recently, a variety of funding incentives in the HPEA aimed at stimulating a more even geographic distribution of primary care physicians in relation to population.

It was indicated earlier in this report that the primary tool used to measure the quantity of physician services available to the population is the health manpower to population ratio, although this measure leaves much to be desired.

Since the use of gross physician/population ratios implies that all providers contribute the same amount and quality of services and that all population segments require the same level of services, which is not the case, a more precise measure would be an "available services" ratio. Other indicators of physician accessibility or availability are office waiting time, travel time to the nearest physician, and waiting time for an appointment. However, little data and analyses currently exist on these latter indicators, so that the physician/population ratio is the standard typically used.

Based on physician/population ratios by region, State (See Table A-IV-5), non-metropolitan versus metropolitan areas, county, and Health Service Area, it is evident that there is a highly uneven distribution of physicians in the U.S. Moreover, the trend for all M.D.'s, and especially all primary care M.D.'s (including obstetrics/gynecology), became more uneven between 1970 and 1973; M.D.'s were the only health profession to show little or no improvement in distribution over this period. 1/ Furthermore, the number of counties without a physician grew more than 30 percent between 1940 and 1975. In 1940 there were 46 such counties; by 1975, the number had reached 141. (It should be noted, however, that improvements in transportation accessibility with better roads and more cars, and loss of population in counties without a physician make this rise in physician-less counties less meaningful that it might appear on the surface.)

Physician/population ratios for metropolitan as compared to non-metropolitan counties further illustrate the geographic situation. In 1963, non-metropolitan counties had a ratio of 73.8 non-Federal physicians per 100,000 population and metropolitan counties a ratio of 144.2/100,000, a difference of 70.4 per 100,000. The ratio in metropolitan counties increased at a more rapid rate than in non-metropolitan counties and reached 153.3/100,000 in 1974, while that in non-metropolitan counties dropped to 70.4/100,000, widening the difference to 82.9/100,000. Similarly, the difference between the highest and lowest State ratio has been increasing, from 132 in 1959 (New York-187 and Alaska-55) to 146 in 1974 (New York-221 and South Dakota-75).

The uneven geographic distribution of physicians is also affected by the uneven national distribution of osteopathic physicians, who, in some regions, represent a sizable component of total physician manpower. Doctors of Osteopathy have traditionally shown a preference for rural primary care practice, but until the late 1970's only about one-half of the States gave full medical liceses to D.O.'s. This resulted in an uneven distribution of ostepathic physicians which continues to the present in many States, The uneven distribution of these practitioners also reflects the small number of osteopathic schools and graduate training programs. At the present time, all States give full licensure to osteopathic physicians.
The largest number of osteopathic physicians was in Michigan--an estimated 2,360 in 1975--but there were only 2 in Mississippi. Overall, the ratios of active non-Federal osteopathic physicians per civilian population range from 0.1 per 100,000 in Mississippi to 26 per 100,000 in Michigan, as compared with a U.S. average of 6.4 per 100,000 (See Table A-IV-6). In the States in which D.O.'s are concentrated, they are relatively evenly distributed among communities of different size.

There are many factors which may serve to compensate for or explain the disparities in physician-to-population ratios that have been noted

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1/ Morrow, James S. "Toward A More Normative Assessment of Maldistribution: the Gini Index." Inquiry. Volume XIV, September, 1977. Blue Cross Association, Chicago, Illinois pp. 278-292.

above. Demand may not be the same in one area as another, and this disparity may have been growing larger. Part of the differential demand possibly relates to differential morbidity rates and environmental hazards. For example, Standard Metropolitan Statistical Areas (SMSA's) in some respects represent a more hazardous environment than rural areas with regard to pollution, industrialization, crime and higher accident rates. Variations in the quantity of services provided by individual physicians, as measured by the number of patient visits, is also a factor and is dependent on such things as specialization, type of practice, employment setting, geographic location, sex, age, and number of hours worked.

A comparison of the quantity of services in these areas is incomplete when confined solely to physician/population ratios. Reinhardt 1/ has shown that where physician to population ratios are low, physicians often achieve higher productivity by utilizing more auxiliaries. As he points out, there were 161 physicians per 100,000 persons in the Northeast and only 95 in the East South Central and the number of physician visits per capita and the number of hours physicians worked were the same in the two areas; however, physicians on average utilized 2.1 auxiliary personnel in the East South Central versus 1.3 in the Northeast. Nevertheless, because of the absence of comprehensive national data and research indicating the exact extent of area by area variations in physician productivity, requirements, utilization of auxiliaries, utilization of group practices, and other types of compensations, the physician/population ratio remains the best general indicator of geographic distribution.

Undergraduate Allopathic and Osteopathic Education

The number and capacity of medical and osteopathic schools have risen markedly over the last 15 years. The number of medical schools has increased by one third while the number of osteopathic schools has increased by 50 percent. First year enrollments (FYE's) in schools of medicine have nearly doubled to a level of over 15,000 in 1975-76, while first year enrollments in schools of osteopathy have more than doubled to about 1000. Similar trends occurred among graduates from both professional schools, where M.D. and D.O. graduates totaled about 13,500 and 800 respectively in 1975. (For a detailed listing of all medical and osteopathic schools and enrollments see Tables A-IV-7, and A-IV-8 respectively.)

Legislation to provide financial assistance to persons from disadvantaged backgrounds coupled with the establishment of programs to encourage the admission of both women and disadvantaged persons to

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1/ Reinhardt, Uwe. Production Function Estimation Under Differing Levels of Market Tightness. Princeton University, Unpublished Paper, March 23, 1976.

health professions and other schools led to increased enrollment of women and minority persons in medical schools after 1965. The upward trend in medical and osteopathic school enrollment of women continued through 1975-76, with the proportion of women in first-year classes more than doubling since 1970-71 (See Table A-IV-9).

Women represent nearly one quarter of the medical school entering class and nearly one-seventh of the osteopathic school first year class. However, the proportion of female FYE's in allopathic medical schools has leveled off in the last two years, while the proportion in osteopathic schools still appears to be climbing.

The proportion of minorities in first-year classes has increased less dramatically than that of women, and actually declined in 1975-76. The greatest decline in first-year enrollment of minorities occurred among Afro-Americans, generally the minority group with the largest numerical and proportional representation. The number and proportion of American Indians also decreased in 1975-76, whereas the proportional representation of Mexican Americans and mainland Puerto Ricans did not change. These trends are summarized in Table IV-7.

While the reasons for the decline in minority enrollment are not certain, the rapidly spiraling costs of attending these schools in conjunction with the declining availability of scholarships, particularly those without service commitments, and the increased neccesity for reliance on loan sources, may be major contributing factors. In addition, questions about affirmative action programs may be forcing some schools to rely more heavily on the use of "traditional" admissions criteria.

Financing Undergraduate Medical Education

The Federal government's interest in the financing of medical education--both pre- and post-doctoral--derives from its goal of improving access to health services. Achievement of this goal depends upon the assurance of adequate training programs, faculty, and institutions to maintain or expand the supply of health professionals as needs dictate. Thus, Federal legislation in the past provided financial resources for constructing medical facilities, for increasing student enrollment, for institutional support, and for special programs. In 1965-1966, 54 percent of medical school support was derived from Federal funds, whereas such funds made up only 40 percent of medical school support in 1974-1975.

Since 1965, medical schools have instituted many new programs as a result of new developments in educational technology, reassessment of curricula, broadening of societal expectations of physicians, and changing roles and functions of various members of the health care delivery team. In addition, schools have undertaken experiments in shortening the length of training programs; influencing career and geographic location patterns of students through preceptorships and other remote site training and provision of new faculty role models; and have developed courses in social and community medicine, humanistic medicine, nutrition, drug abuse counselling, sex education, and others.

These and other efforts to improve the process and content of undergraduate medical education have evolved in part due to stimuli provided by Federal financial incentives and program guidelines. Current Federal health manpower legislation--The HPEA--reflects the view that the increased numbers of medical and osteopathic schools and expanded enrollments will soon alleviate the manpower shortages perceived in the early 1960s, therefore obviating the need for further expansion at this time. Current legislation continues capitation grants to support the education process but without the need for expanded enrollments as a condition of eligibility. However, capitation grants have accounted for only about three percent of total support over the past three years.

Although capitation grants have been continued, other Federal programs have been reduced or otherwise modified, such as research training grants and special project grants. Total Federal support from all sources as a percentage of total costs has declined, generating a need for other types of financial support, including development of faculty practice plans and higher tuitions. While Federal dollars or contributions increased two and a half times between 1965 and 1974, State and local government dollar contributions increased over five fold, and medical service plan contributions increased over twelve fold.

These comparisons, made available by the Assocation of American Medical Colleges and published in the Journal of the American Medical Associaton, indicate that while Federal programs and targeted incentives have helped medical and osteopathic schools to expand enrollments, the expansion has required an even greater investment of funds from other sources. If the proportion of Federal funding continues to decline, then some schools, especially those without significant State or local government support or substantial endowments, may find it difficult to maintain the gains made during the last decade without resorting, to drastic tuition increases. (In a few schools tutition already exceeds $5,000 per year.) Programs such as the National Health Service Corps scholarship and loan programs will help students attending schools not receiving large State or local contributions to finance their educations. How these changes and forces will affect the opportunities for financially disadvantaged groups to achieve equal access to health careers and practice opportuntities remains an unanswered question.

One possible effect will be that only students from progressively higher socioeconomic backgrounds will be able to afford medical school. In fact, a comparison of the 1970 and 1975 family income distributions of medical students and the distributions of family income of first time students in higher education shows such a trend, although the cause of this trend can only be inferred (See Table II-12).

The soundness of medical education programs and the training capacity of these schools relate directly to the Federal incentives and guidelines provided to them, and the consistency and continuity of Federal programs. The consolidation of public and private, lay and health professional viewpoints, and innovative ideas and their translation into options and alternatives for Federal action programs, require a focus and depth of expertise that is being built in the Public Health Service. The primary need is for a broader understanding of the workings of our medical education system, including its complex financial structure.

Curricula Developments

Medical school programs vary widely, but the traditional and currently the most common organization of study consists of an average of 36 months study over a period of four years to achieve the M.D. degree. Approximately one-third of the schools have accelerated programs that permit the medical curriculum to be completed in three calendar years.

Twenty-four schools have combined college/medical school programs, whereby high school graduates are accepted into an integrated curriculum. Eighty-five schools offer combined M.D. - Ph.D. programs. Six schools now have formal programs to accept applicants with a Ph.D., so that an M.D. may be earned in a reduced period of time.

In the clinical years, the student rotates through an average of seven clinical clerkships in the various medical services, spending varying periods of time in medicine, surgery, pediatrics, obstetrics-gynecology, psychiatry, and other subjects. Because of the diversity of curricula among schools, not all institutions have rigid requirements.

According to the Association of American Medical Colleges, a characteristic of medical curriculum change is that most schools now have students participating to a significant extent in curriculum deliberations. 1/ It has become increasingly common for students to be appointed as working members of curriculum committees.

1/ Medical School Admissions Requirements 1976-1977. Association of American Medical Colleges. Washington, D.C., 1975.

Graduate Medical and Osteopathic Education

Licensure

The majority of graduates from medical or osteopathic schools continue their formal education in residency or internship programs. However, the right to practice after graduation from medical or osteopathic school is contingent upon the graduates' meeting conditions prescribed by the State licensing board in the State in which they plan to practice. Thus, the first responsibility of a new M.D. or D.O. recipient is State licensure, and the process and timing differ from State to State. A written examination is part of the process in all States. The overall failure rate on State board examinations in 1975 was 43 percent, with foreign medical graduates generally having a higher failure rate as a group than U.S. graduates.

In 1975, there were 36,621 licenses issued by the 54 State and territorial licensing boards to allopathic physicians, and 1,547 to osteopathic physicians. Approximately 20,000 of these licenses were other than first or initial licenses; 5,900 were first licenses to foreign medical graduates; and about 12,000 were first licenses to U.S. graduates of allopathic and osteopathic schools. Two hundred twenty-one first licenses were issued to U.S. citizens who had graduated from foreign medical schools. Among allopathic physicians, eight percent are not licensed in any State. Among foreign medical graduates who have been in the United States for five years or less about 60 percent have a restricted license to practice. It is noteworthy that Canadian medical schools are accredited by the same body that accredits U.S. medical schools, and Canadian and U.S. graduates perform similarly on board examinations. Graduates of Canadian medical schools are considered for licensure by all States on the same basis as graduates of U.S. medical schools.

Requirements for a physician to be licensed by the Federal government exist only for a few specific activities in his or her practice, such as prescription of narcotics and use of radioisotopes or radiation under certain conditions. In an attempt, however, to bring some degree of standardization into State licensure requirements, the Federation Licensure Examination (FLEX), based upon national board questions, was developed in 1968. Nearly all States have now adopted FLEX as their official board examination and thus it will become the standard test for licensing of physicians. (The great majority of licensure examinations in recent years both for foreign and U.S. graduates were FLEX).

Maintenance of Competency

State licensure usually permits a physician to engage in any type of medical and/or surgical practice, and until recently, such a license was valid for the life of the physician, upon payment of a periodic token registration fee and avoidance of any criminal activity. More recently, some States have initiated a requirement that physicians demonstrate some effort to maintain and improve their skills. Generally, the requirement is for some evidence of the physician's completing a specified number of hours of continuing medical education (CME) when periodic license re-registration or renewal occurs generally every three to five years. In 1975, 15 States required by statute such continuing medical education for re-registration. There were 436 institutions offering 10,184 continuing medical education programs or courses for allopathic physicians in 1974-1975, and over 270,000 individual physicians participated in such courses. As more State medical boards, professional societies and national specialty boards adopt more explicit standards for continuing medical education, these figures will increase greatly. The figures reported here do not include the hours of personal study, informal course instruction, self-assessment programs or other learning systems used by physicians.

Continuing medical education--150 hours for the period June, 1973, through December, 1976--was required for all active osteophatic practitioners in order to maintain membership in the American Osteopathic Association (AOA). Because such membership is required for most professional activities, this is tantamount to a universal requirement for continuing medical education for all osteopathic physicians.

Certification

Given the increase in medical knowledge and technology in the past quarter century, more and more medical and osteopathic school graduates are voluntarily obtaining specialized training beyond that required by State laws. Such training takes place in residency and fellowship programs that usually have little or no basis in State or Federal laws. Today, over 90 percent of new graduates go on to some postgraduate training programs, often of several years duration.

The various specialties each have one or more national organizations or a consortium of organizations that promote criteria for excellence in specialty education and practice. Within each major specialty, there is a Specialty Board which develops special requirements for individuals to be permitted to take a comprehensive examination on the scientific and clincial aspects of that specialty. Such Boards are incorporated as free-standing, non-profit, education entities but with strong ties to the major national medical and osteopathic associations. They are not a part of any legal licensure system or State licensure boards.

There are 22 allopathic and 14 osteopathic specialty Boards, with several sub-specialty Boards. Individual physicians who have completed the training requirements specified by the Board in a given specialty, have met the moral and character standards of the Board and have passed an extensive examination by the Board, may be certified as having special competency in that specialty and are called Diplomates of the Board. In 1975, forty-two percent of all active physicians were certified by one or more specialty Boards. In the past, an individual maintained the Diplomate status for life without need for further demonstration of competency. Today, proof of continued competency is being required by more and more boards, and in some instances, re-certification is required periodically. All of the allopathic Boards now have developed policies favoring re-certification. All of the osteopathic specialty boards require membership in the AOA which has a CME requirement. Therefore, demonstration of continued learning efforts is required of all osteopathic diplomats.

Successful completion of the certification process of the Specialty Boards in and of itself has no legal entitlements. In eight States, possession of such certification by foreign medical graduates or U.S. graduates licensed in a different State may lead to the granting of a license to practice by any of those eight States, without the individual having to submit to any additional examination.

Impact of Licensure and Certification on Physician Supply and Distribution

Since States control the licensure process, physician migration patterns depend on the willingness of one State to accept for licensure a physician licensed in a different State--a process called reciprocity. Many States have reciprocity agreements with other States, although these are not always explicit, for the first several years after a candidate graduates. Also, most States will grant a licensing examination within specified time periods following graduation from medical or osteopathic school. However, policies differ, and final decisions are usually made by State Medical Licensing Boards on a case-by-case basis. There has been no quantitative assessment of the impact of different State licensing practices on physician migration.

First-Year Residency Positions

There has been a steady and substantial increase in the number of U.S. medical school graduates (USMG's) since 1970 (See Table A-IV-10). During this same period, the number of foreign medical graduates (FMGs) entering first-year residencies has fluctuated between about 4,000 and 5,000. The total number of first-year residency positions offered by teaching hospitals has increased at a rate slower than the rate of increase in filled positions, resulting in an increase in the fill rate (the percent of offered positions filled). The observed fill rate is not constant across specialties--the surgical specialties exhibit high fill rates while other specialties, in particular anesthesiology, radiology, pathology, and other hospital-based specialties, have substantially lower fill rates. (See Table IV-8.)

As indicated earlier, the HPEA seeks to restrict the number of FMG's entering this country to practice, through amendments to the Immigration and Nationality Act. A decrease in the level of immigration of FMGs will have differing effects geographically and across specialties. Rhode Island, New Jersey and New York draw 50 percent or more of their physicians in residency programs from the foreign population, while six other states draw more than 40 percent. Residency programs in anesthesiology, general practice, pathology, and physicial medicine have 50 percent or more FMGs and other specialty residency programs have, in the aggregate, more than 40 percent FMGs. Although waivers of the restrictions placed upon FMG non-immigrants by the HPEA can be granted in cases where "substantial disruption" to the health care delivery system has been identified, the effects of the HPEA in the near future could be substantial as they relate to the FMG permanent immigrant component in GME.

By tying capitation grants for medical schools to the attainment of target levels of filled positions in affiliated primary care GME programs (general internal medicine, general pediatrics and family medicine), the Congress has moved to increase the proportion of physicians entering practice in the primary care specialties. In order for medical schools to be eligible for capitation grants, their combined affiliated GME programs must, on July 15, 1977, have had 35 percent of all filled first-year GME positions in primary care. This percentage increases to 40 percent in the following year and to 50 percent in subsequent years. In addition, the amount awarded is discounted for each physician who transfers out of a primary care specialty during or at the end of the first-year of GME. Teaching hospitals can attain the target percentage by increasing primary care offerings, or by decreasing offerings in other specialties, or both.

Primary Care Curricula in Graduate Medical Education

Physician behavior is thought to have a significant impact on health care costs. One possible explanation can be derived from the process of medical education. Much of the emphasis on technical input-intensive medicine, reinforced by encouraging specilization and promoting expensive procedures, can be found in graduate medical education.

In an attempt to stem the tide toward specialization, the HPEA has made the awarding of capitation grants conditional upon a required percentage of a medical school's residents being in primary care fields. Other directives of the HPEA have attempted to spur the specialty choices of future medical school graduates by providing authorizations for training in family medicine, general internal medicine, and general pediatrics, along with financing departments of family medicine, student fellowships in primary care, and interdisciplinary training programs.

An emerging linkage between medical schools and their affiliated teaching hospitals is surfacing in medical education, particularly in primary care, where medical schools and these hospitals now share many educational activities such as rural preceptorships. Moreover, this link has been reinforced by under- graduate subsidies related to the graduate programs noted above.

The goal in the training of qualified physicians is no longer to produce as many as possible. The objective now is to produce the "right number of the right kind." This phrase has come to mean increased numbers of physicians in primary care specialties, fewer physicians per capita in surgical specialties, and no proportionate increases in other specialties.

Recent research has indicated that one of the factors which relates to ultimate practice location, particularly for specialists, is location of their graduate medical education, probably because of the need for familiar technical support. The responsibility for GME has been placed in the hands of institutions which have a service rather than an educational commitment as their most important function. Interns and residents do play a significant role in health care delivery despite the fact that they are "in training." Differentiation of their role in the provision of patient services from their role as trainees has concerned both the Congress and third party payers. According to an activity analysis conducted for the Social Security Administration by the Institute of Medicine and involving over 5,000 House Officers (interns and residents), about 61.0 percent of their time is spent in delivering patient care; 14.9 percent in the combined activities of patient care with teaching; 15.7 percent in learning; and the remaining 8.3 percent in teaching, research and other activities. Among the ten individual specialties included in this study, the amount of time devoted to patient care alone varied from 47.5 percent for pathologists to 70.7 percent for anesthesiologists and 73.8 percent for family practitioners.

The development of residencies themselves was predicated upon the profession's need for further subspecialty education over and above that necessary for general practice. It is therefore understandable that tertiary care facilities have been the center of this education. Residency positions offered by specialty are more a function of department prestige, adequacy of resources to sustain the educational programs and institutional service requirements, rather than community and national needs. Hence, an objective of primary care curricula is to expose the student to alternative sites and modes for the delivery of care such as those beyond the reach of the traditional teaching institutions.

Historically, the clinical emphasis in GME primary care curricula has been toward outpatient experiences. However, the facility of referral services available to the primary care resident in the outpatient setting has continued to reinforce the technical support dependency.

Recent additions to primary care curricula of clerkships and preceptorships in rural and other non-hospital based settings are expected to redirect the outlook of future physicians. The actual impact of these new educational experiences upon ultimate practice behavior has been difficult to document. Present evaluation is confined to student performance, perceptions, and attitudes along with analysis of ultimate specialty and practice location. The results to date are inconclusive.

Some physicians have expressed concern about the legitimacy of family practice as a distinct specialty. Many medical school faculty find that primary care does not represent a real body of knowledge distinct from the disciplines of internal medicine, pediatrics and other specialties. This attitude is not lost on the prospective physician. Others are willing to accept the new field but it may be displaced from the university hospital medical setting. It is essential for the viability of primary care GME to educate the educators toward the acceptance of non-university-hospital settings as important sources of medical education.

The emphasis on primary care has always dominated Graduate Osteopathic Education (GOE). However, in recent years graduates have chosen non-primary care specialties at significantly greater percentages than in the past. Historically, with limited resources, schools of osteopathy have relied upon community-based hospitals for GOE since access to academic centers was not available. Increased recogniton of osteopathic medicine has increased the trend towards specialization, and it is not certain that osteopathic schools can continue to produce primary care practitioners and emphasize their holistic philosophy.

First Year Residency Distribution

Critical to the forecasting of the future supply of physicians by specialty is the understanding of past trends in the distribution of first-year residency training positions. During the period 1960-1974 there were marked changes in prevailing trends. The period 1960-1968 showed declines in the percent of first year residencies in the primary care and surgical specialties, with increases in the other medical specialties. For the primary care specialties, decreases in general practice and pediatrics residencies were offset somewhat by a slight increase in those in internal medicine. Residencies in the surgical specialties of ophthalmology, otolaryngology, plastic and thoracic surgery showed increases, but these were offset by decreases in obstetrics/gynecology and general surgery. Other specialties such as dermatology, anesthesiology, neurology, and radiology have accounted for the expansion in "other specialties" over the eight year period (See Table IV-9).

The above trends changed considerably in the 1969-1974 period. Filled first-year residencies in primary care specialties increased noticeably, due to strong increases in the number of internal medicine residencies and to the addition of family practice residencies (representing 6 percent of first year residencies in 1974). The slight decreases in general surgery and psychiatry residencies observed in the 1960-1968 period became larger decreases in the 1969-1974 period, while obstetrics/gynecology residencies leveled off. Increases in ophthalmology, otolaryngology and anesthesiology reversed themselves in the latter period.

There were significant differences in residency choices of foreign and U.S. medical graduates. Primary care residency selection by USMGs increased more than that of FMGs between 1968 and 1974. Drops in general surgery and anesthesiology were more noticeable for USMGs while increases in pediatrics and psychiatry were more prevalent for FMGs.

The above information on first year residencies requires careful interpretation. Figures on primary care residents overstate the ultimate number of primary care specialists, because increasing numbers of internists and pediatricians later enter subspecialties. For example, recent trends indicate that about 9 percent of the individuals in first year residencies in internal medicine were not in the second year of that program. It has similarly been estimated that about one-half of first year internal medicine residents will later enter internal medicine subspecialties. A similar phenomenon has occurred in pediatrics, although to a lesser extent than in Internal Medicine.

Finally, the degree to which residents enter subspecialties varies according to the resident's country of medical education. For example, although first year residency figures indicate greater primary care participation by USMGs, an analysis of subsequent years in residency indicates that a far larger percent of USMGS in internal medicine, pediatrics, and surgery go on to subspecialties than do FMGs. Consequently, FMG's now in training may be a more significant source of future primary care physicians than the figures seem to indicate.

Financing Graduate Medical Education

As the medical education process has lengthened to include advanced postgraduate training for over 90 percent of graduates, a complex and not wholly coordinated process of internship and residency training has evolved. The components this process are poorly defined, as is the mechanism for financing graduate medical education. It is noteworthy that there is no single source in this country that can provide an accurate enumeration of all the residency and internship training programs and positions offered and filled, nor can such a measure be made by consolidating any combination of data sources. It is estimated that there were between 70,000 and 75,000 such positions filled in September, 1974--the latest year that composite data are available. At an average annual salary of $13,000 per year in 1974, the cost for salaries alone exceeded $878 million dollars. When the instructional costs and supportive services are added to salaries, the costs to the system of residency and internship training in 1974 were estimated to exceed $1.8 billion annually.

For the most part, these costs are passed along to patients through per diem or hospital bed charges. Costs of training that takes place outside the hospital or in ambulatory care clinics cannot be passed on to bed charges. About one-half of the costs of ambulatory services are covered by third party payments, and the remainder is either paid out-of-pocket by patients or recovered by the institution from grants or unrestricted funds from other sources.

There have been recent efforts by some private insurance agencies or carriers and by some State and Federal agencies to restrict or eliminate reimbursement to institutions for the costs of residency training. These recent developments further complicate the chore for institutions to develop sound financing bases for internship and residency training, especially in the primary care specialties.

The Federal government is seeking to influence the distribution of training positions in favor of primary care residencies through the Health Professions Educational Assistance Act of 1976, which provides grants for expansion of opportunities for training in family medicine, general internal medicine, and general pediatrics. It is estimated that by 1983, there may be over 3,000 first year residency positions in general internal medicine and general pediatrics, and over 4,300 first year positions in family practice, due in large part to Federal grant programs. Paradoxically, however, while Federal manpower programs are providing needed support for primary care training, reimbursement policies are being considered by some third-party payers which would require that institutions subtract manpower training grants in primary care from their requests for reimbursement for services provided by trainees. If implemented, the net result might be that institutions would be returning a portion of their Federal primary care training dollars to third party payers. The effect, of course, would be to impair the effectiveness of the primary care training grants.

What is needed in both predoctoral and postdoctoral training is a national policy that addresses national physician manpower requirements for the future and a medical education financing system that is sufficiently stable to cover the seven or eight year process involved in producing a single cohort of physicians. The Graduate Medical Educational National Advisory Committee (GMENAC) has been chartered by the Secretary of Health Education, and Welfare to examine the present and future supply and requirements of physicians by specialty and to translate these physician requirements into ranges of types and numbers of needed graduate medical training opportunities. The Committee is further chartered to propose national goals for the distribution of physicians being trained and to examine the impact of various public and private policies which influence physician specialty distribution, particularly reimbursement and financing. GMENAC had its first meeting in 1977 and will report in December 1978. As that report to the Secretary is being developed, an intensive effort is being made to collect and analyze information obtainable for the most part from the private sector.

The Projected Supply of Physicians

The number of active physicians (M.D.'s and D.O.'s) is expected to rise significantly in the years ahead, reaching 594,000 in 1990, as compared with 362,500 in 1974 and 378,600 in 1975. The physician to population ratio is expected to increase from 171.1 per 100,000 population in 1974 to 242.2 per 100,000 in 1990. The supply of active M.D.'s is projected to increase to 564,200 in 1990, from 349,000 in 1974, with the active M.D. to population ratio increasing from 164.7 per 100,000 population in 1974 to 230.2 per 100,000 in 1990 (See Table A-IV-11).

These preliminary projections prepared by the Bureau of Health Manpower are derived essentially from two distinct estimation matrices, using the 1974 active supply of M.D.'s by specialty as the starting point. The first matrix produces a "basic" projection of year-by-year future M.D. graduates and separations from the active work force by country of medical education. The second matrix distributes the future graduates and separations by specialty, disaggregated by country of medical education. "High" and "low" estimates of aggregate physician supply that have been developed are summarized in the text, but are not included in the tables in this report.

The first matrix projects graduates and foreign additions utilizing estimates of first-year enrollments, student attrition, other medical school-related trends, and a model of Foreign and Canadian Medical Graduate (FMG/CMG) immigration. The second matrix distributes the graduates among medical specialties through projections of first-year residency trends, and computes deaths and retirements of active practitioners among the specialties, using mortality and retirement rates and age distribution data specific to each specialty.

Projections of the future specialty distribution of graduates based on trends in filled first-year residencies entail certain assumptions. For example, the assumption is made that M.D's who take training in a given specialty will subsequently practice in that specialty. Actually, M.D.'s do shift their specialty interest subsequent to their initial postgraduate training, but little is known about these shifts and the actual content of the specialists' practice. Additionally, the graduate medical education (GME) environment is in a fairly rapid state of flux. The "rotating", "shifting", and "duplicative" training will have unknown effects on the future specialty distribution of graduate training slots.

Table A-IV-11 displays the preliminary projections of the "basic" supply of active M.D.'s by country of medical education and of D.O.'s, for 1980, 1985 and 1990. These projections include an analysis of the potential impact of PL 94-484 in the projection period. Despite the large increase in total numbers, the projections reflect a substantial decline from previous years in FMG additions to the physician pool, and a minor increase in the rate of acceptance of transferees from foreign medical schools into U.S. medical schools.

Table A-IV-12 displays the distribution of filled first-year residency positions in 1974 by country of education. Adjustments were made to this distribution, as reported by the AMA, to account for duplication caused by some physicians taking a second first-year residency in a more specialized area. This adjustment was performed for internal medicine, pediatrics, general surgery, psychiatry, and pathology. The relationship of the specialty distribution of the 1974 active supply to the specialty distribution of the 1974 adjusted first-year residencies is shown in Table A-IV-13.

As mentioned earlier, recent trends as well as anticipated changes in the GME environment portend major shifts in the future specialty distributions of GME training slots. Table A-IV-14 displays the "basic" specialty projections based on an extrapolation of shifts in first-year residencies (FYR) for the years 1967-68 through 1973-74. In this relatively rigid statistical approach, each specialty was projected to continue its individual linear, curvilinear, logistic, or other recent pattern to 1980, at which point the distribution was held to 1990. The year 1980 was chosen as the final extrapolative year because historical data on which such extrapolations need to be based extend for only six years, and this limits extrapolation into the future to a six year period when using standard statistical techniques. (See Table A-IV-15)

As the tables show, the primary care "marker" specialties are expected to claim an ever increasing share of the supply of active M.D.', climbing from 38.4 percent in 1974 to 44.5 percent in 1990. In this trend projection, increases in the proportion of primary care manpower vis-a-vis total physician manpower in large part reflect the recent changes in specialty preference of physicians entering graduate training--a change from non-primary care specialties to primary care specialties. This is also related in part to the widely publicized shortages in primary care and to Federal support of family practice. These projections also indicate that "other medical specialties" are expected to increase from 5.3 percent of the total in 1974 to 6.0 percent in 1990, and that the surgical specialties and "other" specialties will show declines in their proportion of the total.

By applying the first year residency trend line to high and low assumptions of U.S. graduates and FMG additions, a range of estimates was developed which is intended to reflect additional parameters of possibilities. According to this analysis, the number of active

M.D.'s practicing in the primary care marker specialties may range from 242,000 to 260,300 by 1990.

The specialty distribution of D.O.'s is particularly difficult to project, not only because of a lack of basic data on graduate training slots, but also because the GME system is in a state of change. Approved residency programs are accepting D.O.'s in increasing numbers, which could lead to increased specialization among younger D.O.'s. On the other hand, there are persons within the D.O. profession resisting such a change and arguing for continuation of the unique primary care orientation that has characterized the osteopathic profession. Some of the possible alternatives are described below.

If the current proportion of D.O.'s in primary care were to remain the same through 1990, there would be a primary care physician/population ratio of 7.2 per 100,000. However, if if D.O. graduates from 1978 on were to enter first year residencies in the same proportions as projected for M.D.'s, the proportion of D.O.'s in primary care in 1990 would decline to about 52 percent, and there would be about 15,500 primary care D.O.'s, with a primary care D.O. population ratio of 6.3. As another extreme, if D.O.'s were to primarily follow the first year residency patterns exhibited in current graduate osteopathic education programs, with 22 percent going directly into general practice without taking residency training and about 60 percent of the first year residents additionally training in primary care specialties, the proportion of D.O.'s projected to be in primary care in 1990 would be about 64 percent, with about 19,000 D.O.'s in primary care and a primary care D.O./population ratio of 7.8 per 100,000 population. The alternatives thus fall within a range of 15,500 to 19,000 D.O.'s in primary care fields by 1990, with the basic estimate of about 17,500.

Generally speaking, all of the above projections show increases in absolute numbers of physicians in the primary care categories, both M.D. and D.O., and substantial increases in their population ratios. Again, however, it should be kept in mind that these figures represent primary care physician "head counts", not primary care services.

The projected increase in aggregate physicians is of such magnitude, compared to expected increases in the U.S. population, that even if the proportion of all physicians in primary care were to decrease, the primary care physician/population ratio would still rise substantially.

Physician Productivity

Physician productivity is a major factor in the evaluation of the adequacy of the net physician supply and in the determination of the net requirements for physicians. As a concept, the term is generally understood but rarely defined in a totally satisfactory manner, largely because health status outcomes--physicians' products--are not solely dependent upon the quantity and quality of services provided. For purposes of this report, productivity is defined to be the amount of services provided by a given physician over a given time period.

Physician productivity is most often measured by the number of patient visits or encounters per physician per week, or hours or weeks worked over a period of time. Such measures as income, gross receipts, and expenditures for physician services are also sometimes used. These measurements vary widely by type of practice, by and within specialty groups, as well as over time. The potential answers to questions about the meaning, extent, and causes of this variability have significant implications for the delivery of services, current and future.

Theoretically, physicians can alter their productivity in many ways. They can devise new techniques which enable them to spend less time with each patient while maintaining health care quality, and thus see more patients in the course of a workday. Such techniques may include the employment of mid-level assistants, affiliation with one or more other physicians, or improved organization of their work facility or their services. (See Table A-IV-16)

For example, AMA data show that two-man groups provide 27 percent more visits per physician per week than do physicians in solo practice. To date, estimates of productivity gain (as measured by patient visits) from employment of midlevel practitioners such as nurse practitioners, physician assistants, and nurse midwives vary widely, but are positive in magnitude, with increases in patient visits resulting from their utilization ranging from 25 to 100 percent, depending on various factors.

In recent years, there has been a substantial incorporation into the U.S. health care delivery system of innovations and changes which theoretically should have resulted in increased physician productivity. Although the annual growth rate of group practices has tapered off in recent years, it increased at a rate of about 4 percent between 1969 and 1975. Recently the supply of other care-delivery practitioners has been increasing, more States have been amending their medical practice acts to give the physician greater latitude in delegating tasks to assistants, and physicians are employing more assistants.

However, an analysis of trend data on several measures of productivity does not conclusively reveal a positive upward trend. Average weeks worked per year, average hours worked per week, and average patient visits per physician, although showing small increases in the early 1970's, dropped back to 1969 level in 1974. However, there have been appreciable increases in M.D. net income, particularly in the primary care specialties, and appreciable growth in initial visit fees.

The question of what has happened to theorized productivity increases remains. Do increased fees and incomes reflect increases in the amount of services provided per patient visit? Is the physician spending more time per visit and seeing fewer patients per day, thus increasing his leisure time or providing more intensive services?

What explains the productivity increases observed in group practice data?

Studies have recently been conducted to examine these and other questions relating to physician productivity. One study concluded that as a physician is faced with increased demand, he may increase his prices but not see additional patients. In fact, he may see fewer. This is known as a "backward bending supply curve," in which a point is reached in the quantity of services demanded where prices increase for even slight increases in the quantity demanded. Other studies suggest that physicians are able to maintain similar practices under widely different market conditions, possibly through the use of waiting time to appointment as a rationing device. That is, if there are more physicians per capita, the number of visits per physician may be maintained at the same level as with fewer physicians per capita by lowering the average appointment waiting time.

Much more needs to be done in this area before conclusions can be drawn that are firm enough to affect health policy. It may ultimately be concluded that the physician/population ratio has meaning because physicians tend to behave the same under widely differing market conditions. Conversely, it may be concluded that current measures or proxies for productivity are inappropriate--that they are not yet measuring the right thing. Answers to the questions that have been posed could have major implications for health manpower policy, by permitting better assessments of future demand and requirements, furnishing added insights into the future impact of National Health Insurance, and leading to better evaluation of the need for physicians.

Projected Requirements and Evaluation

Projected Requirements for Physicians

The definition and achievement of a balance between the supply of and requirements for all categories of health manpower have occupied the attention and efforts of legislators, educators, health professionals, researchers, analysts and others for many years. Whereas estimates of future supply can be made with some confidence, the estimation of future requirements is fraught with uncertainties. Future changes in technological advances, morbidity rates, structure of the health care delivery system, health insurance utilization and structure (including National Health Insurance), delegation of responsibilities and tasks to auxiliaries, cure rates, preventive care requirements, quality requirements, and so on, are exceedingly difficult to predict. However, the preliminary estimates described below suggest that supply and requirements for physicians in an aggregate sense will come into balance in the 1980's, and that by 1990 the aggregate supply of physicians may very well exceed requirements, the requirements estimates on which these supply-requirements situations are based assume that no major unforeseen events occur; that the characteristics of and relationships within the health care system remain much as they are today; and that physicians do not increase their leisure time and thus lower their working hours and income.

The previous sections of this chapter highlighted descriptive aspects of physician manpower, presenting historical and projected profiles of aggregate and specialty physician supply, and indicating the importance of projections of physician requirements and the attendant difficulties of making such projections. Despite these problems, some preliminary requirements estimates for physicians have been developed and are presented here.

Projections of requirements for physician specialties will be provided in future reports. However, some discussion of medical specialty requirements and alternative ways of developing projected specialty requirements are presented in Appendix B.

The estimated future requirements for physicians presented in this report are drawn from the Project SOAR (Supply Output and Requirements) requirements model developed by the Manpower Analysis Branch, BHM. This model is essentially a utilization type model which adjusts for trends in the utilization of health services coupled with projections of changes in the net consumer price of various health services, to estimate trends in the demand for care. A technical description of the model and price adjustments is provided in Appendix B of this report.

Requirements for physicians are derived from projected changes in the demand for health services occurring because of expected changes in the size, age, sex distribution, and constant-dollar income of the population, and because of projected trends in the per capita demand for health services based on historic trends in utilization and changes in providers' prices and insurance coverage. The impact of insurance will depend upon changes in the dollar price level faced by consumers at the time services are sought. The responsiveness of consumers to changes in price varies with the type of care being demanded (e.g., medical office, short-term hospital), and forms the basis for computing alternate series of requirements estimates presented.

This "price-sensitivity", termed the price elasticity of demand, has been the subject of much debate among health economists in the past few years. In general, elasticities are thought to be less than unity (one for one) for medical services, with lower elasticity for the less deferrable care typically provided in short-term hospitals (and over which the patient has less control) than for medical office services. Alternate assumptions about price elasticities were drawn from recent health econometric studies and used in a net consumer price adjustment. The relative effects of these adjustments are described below, while the specific elasticity coefficients used in the model are given in Appendix B of this report. It should be noted that these estimates assume: (1) that elasticity remains constant between 1975 and 1990; (2) that supply and requirements were in balance in 1975; (3) that non-dollar costs of obtaining care do not change substantially during the projection period; (4) that no health care or manpower substitutions occur between service categories; and (5) that physician productivity does not change substantially between 1975 and 1990. These assumptions represent the more salient limitations on the requirements estimates presented, but are by no means exhaustive. (The Appendix should be reviewed for more detailed background on the projection methodology.)

The numbers of physicians utilized in 1975 and estimated to be required in 1980, 1985, and 1990 are presented in Table A-IV-17. According to these estimates, total requirements for physicians are expected to reach between 542,600 and 571,100 by 1990, an increase of between 43 and 51 percent.

As is discussed in more detail in Appendix B of this report, in practice it is difficult to remove completely the effects of supply from the requirements modelling parameters. Therefore, it is extremely difficult to estimate economic (market) demand for physician services and to avoid projecting past trends in the relationship between manpower supply and population, i.e. utilization. As is mentioned above, changes in net consumer price of medical services and projections of trends in per capita utilization adjusted for price change are introduced to modify the utilization trend estimates. What has been done here (and discussed in Appendix B), is to approximate what physician manpower requirements would be if there were no price rationing effects, i.e. no suppression of demand due to increases in the real dollar cost of obtaining care, and to use this as a proxy for modelling requirements if supply were perfectly elastic. In the estimates presented here, therefore, demand is assumed to equal utilization and the general assumption is made that there is no current shortage of health manpower. Indeed, if there is a current shortage and some demand is being rationed out of the health system by a shortage, then the model has underestimated requirements proportionately.

Despite the major increases in requirements projected by the SOAR model, the even larger increase in the supply of physicians in the aggregate means that the Nation is approaching a point at which the level of supply in 1990 may well exceed requirements. While supply and requirements are projected to be approximately in balance by 1980, estimated requirements being only 4-5 percent less than supply (a difference of 17-20,000 physicians), this difference may increase to as much as 9 percent (or 50,000 physicians) by 1990, as the rapid increase in the supply of physicians begins to be felt. Even if these supply-requirements estimates should prove to be entirely accurate, the impact of this potential aggregate numerical oversupply on specialty and geographic distribution is unknown. If traditional supply-demand interactions are in effect, such an oversupply could help bring about a partial resolution of distributional problems. On the other hand, if supply-demand interactions are significantly different for physicians than they are for most other manpower, an anticipated oversupply may bring little if any relief to such problems. The tentative nature of such aggregate requirements projections has made it clear that much further research is needed in this area, with an especially critical need for better estimates of future requirements by medical specialty.

These aggregate national supply-requirements estimates need to be viewed with extreme caution, primarily because of the tentative nature of the requirements estimates. The numbers presented here are only preliminary gross estimates, figures that are still in the preliminary stages of evaluation and analysis and which are subject to change in the coming months. They should properly be viewed as rather simplistic comparisons of total national supply and requirements which reflect patterns of care and supply interactions inherent in the system as of 1975. Factors such as shortages or surpluses of physicians services, either by specialty setting or geographic location, inherent in the current system, have thus been "carried" through the projections. Apart from this general caveat, other more specific considerations such as those mentioned earlier should be taken into account in any efforts to relate the requirements and supply estimates presented here. With adequate recognition of the above considerations, however, the above preliminary figures provide some valuable insights as to the direction that physician manpower developments may be taking in the years ahead.

Data and Analytical Constraints

Before many of the above concerns can be more properly understood and addressed, many gaps in data and analysis must be filled, and general uncertainties about the health care system must be addressed. One major example of the problem is the disparity between manpower "head counts" and actual services available or rendered by this manpower. For example, the specialty projections presented in this chapter assume that a one-to-one relationship exists between the training specialty and the ultimate practice orientation or type of services rendered by the physician in training. Yet, several studies have shown that the relationship is definitely not one-to-one. Ongoing studies are attempting to measure the degree and nature of the disparity, to define such terms as primary, secondary and tertiary care, and to describe who is presently delivering what type of care.

Similarly, with regard to geographic distribution of physicians, the standard manpower/population ratio falls far short of identifying an "available services"/"needed services" ratio because many types of considerations are ignored in physician/population ratios, such as individual physician productivity, population demand, utilization of auxiliaries, prevalence of group practice, population morbidity, practitioner and population age and sex distributions, and other factors.

Another example of data inadequacy results in questions on even the basic number of active physicians in the U.S. The American Medical Association has long been the primary source of data on M.D.'s. However, in 1971, the AMA introduced a "not classified" category of physician into its tabulations and summaries of numbers and types of M.D.'s in the U.S. This change would not have presented a serious problem if the number of "not classified" M.D.'s had remained fairly stable over the years. However, it increased from about 300 in 1971 to over 26,000 in 1975. Since data on the age distribution of the "not classified" physicians shows them to be generally under 40 years of age, and therefore probably actively delivering medical services, the exclusion of these M.D.'s from the count of "professionally active" M.D.'s makes trend data on M.D.'s less accurate then it otherwise might be. Furthermore, data on D.O.'s are collected by the American Osteopathic Association (AOA), in a manner different from that of the AMA, so that headcounts by specialty or geographic area, for example, can rarely be computed for physicians (M.D. and D.O.) as a group. In line with Section 708 of PL 94-484, plans are currently being made to develop a uniform health professions data reporting system for M.D.'s and D.O.'s, primarily through the Cooperative Health Statistics System (CHSS) of the National Center for Health Statistics (NCHS). (This is discussed in more detail in Chapter X of this report.)

There is a final concern which relates to comparability in research design of supply, requirements, and distribution studies being conducted locally under the National Health Planning and Resources Development Act of 1974 (PL 93-641), with studies ongoing at the Federal level. State, local and Federal studies concerning health manpower need to be more closely correlated so that national and subnational efforts can draw on and assist each other in contributing to efficient and effective health manpower analysis. Further, there is also a need for better coordination between State and local approaches, and greater coordination and direction of policy and analytic studies between all levels of Government so that health manpower policies can have the benefit of more compatible comprehensive analyses.

While universities, medical societies, governmental agencies, and some researchers have performed scattered studies in medical specialty requirements, the effort has been largely random and uncoordinated. For these reasons, the Coordinating Council on Medical Education (CCME) of the American Medical Association recently adopted a resolution to determine such requirements, and recommend strategies for altering the distribution of training positions at the graduate level to meet these requirements. In addition, the Secretary of Health, Education, and Welfare, has established the Graduate Medical Education National Advisory Commission (GMENAC), whose charter sets forth a similar effort. Solution of the problem of medical specialty supply, distribution, and requirements will require agreement and cooperation among many research and other organizations, public and private institutions, governmental bodies, and individual providers and consumers of health services.

Non-Physician Health Care Providers

The uneven geographic distribution of medical services as well as the general concern over escalation of medical care costs has contributed to an increased interest in training and utilization of nurse practitioners (NP's) and physician assistants (PA's), often collectively called physician extenders (PE's). Among the reasons for the growing interest in such personnel are their potential for improving access to health care, increasing physician productivity, and helping contain costs of care.

Even though their numbers are small and their future roles in the health care system are not entirely clear, physician extenders could have a significant impact on the provision of health care in the years ahead. Their widespread use holds major potential for substantially increasing physician productivity, for example. Studies have shown that actual productivity gains among individual physicians employing physician extenders, and especially physician assistants, have ranged from 30 to 80 percent. However, the degree to which productivity can be increased nationally by physician extenders is undetermined, since such gains are dependent not only on the potential net increase in productivity per provider, but also on the total number of physicians actually utilizing these physician extenders and on the tasks that they perform. Specifically, more widespread use of nurse practitioners could improve an capability of an employment setting to deal more efficiently with greater numbers of patients, and produce constructive changes in its ability to produce better care through the provision of a broader range of services. However, laws, customs, costs, fees, salaries, available supply, program funding, patient acceptance, and physician acceptance will all have an impact on future utilization of PE's, and the future roles and functions of physician extenders will be determined in large part by developments in these areas.

Current Profile

There are an estimated 8,000 formally trained nurse practitioners (1977) and 4,000 formally trained physician assistants (1977). A sizable number of registered nurses regard themselves as NP's, while a number of PA's are certified but not formally trained. The inclusion of these individuals would bring the estimates to 10,000 NP's and 5,000 PA's in 1977.

These professions are largely defined or titled according to their training and credialling and by the services they deliver. Both physician assistants and nurse practitioners generally provide services under the supervision and responsibility of a physician, although nurse practitioners practice under their own license.

Physician extenders are located and practice more frequently in non-metropolitan and rural areas than do physicians and other health care providers, often in areas currently undersupplied with medical services or physician manpower. Despite their small numbers, PE's even now appear to be helping ameliorate the unequal geographic distribution of medical manpower and services, although it is uncertain whether these distribution patterns will prevail in the future. Because of some major differences between physician assistants and nurse practitioners, the following sections will deal with each separately.

Physician Assistants. Physician assistants (including MEDEX and surgical, urological, and orthopedic assistants) are trained to: 1) elicit comprehensive health histories; 2) perform comprehensive physical examinations; 3) perform simple diagnostic laboratory determinations and understand and use their values; 4) perform basic treatment procedures, and 5) give appropriate clinical response to commonly encountered emergency care situations. 1/

Following the first few years of very rapid growth, the number of programs training physician assistants has leveled off in recent years. As of 1975, there were about 50 programs for the training of assistants to the primary care physician, and a small number of other programs to train assistants for other specialties such as the surgical assistant, the urological assistant, and the orthopedic assistant. The majority of primary care oriented programs receive financial support from the Federal Government, although many receive substantial State and/or private foundation assistance.

Nearly all physician assistant programs have first-year enrollment capacities of 40 students or less, and only a few can admit more than 40 beginning students. There appears to be substantial student demand for entry into this new profession, with ratios of applicants to

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1/ Detmer, L.M., Physician Assistants, Education, Accreditation and Consumer Acceptance, AMA, Chicago, 1975.

available entering class positions ranging as high as 10:1 in some schools. Although there is great diversity among programs, students generally enroll for a two year period leading to certification, with the first year characteristically devoted to didactic work in the basic and clinical sciences and the last year devoted to a variety of clinical rotations (usually under perceptorships in private practice settings).

Of the 2,500 formally trained physician assistants in 1975, 2,100 had graduated from PA programs, while the remaining 400 were graduates of Medical Extender programs, which differ from the other PA programs in that they train students who have already had extensive previous health training and experience. Physician assistants are predominantly male and relatively young. About one-half of all physician assistants possess undergraduate degrees, with most of the remainder having high school diplomas only.

Physician assistants and MEDEX are concentrated in the larger States or in States that have older and well-established programs. However, they tend to locate in non-metropolitan counties more often than physicians do. 2/, 3/

Nurse Practitioners. Nurse practitioners are generally defined by the area of their nursing practice (pediatrics, adult, midwifery). They must have advanced skills for assessing the health illness status of individuals and be able to articulate nursing therapies alongside other planned therapies. 4/ All formally trained nurse practitioners must have a RN degree.

2/ Scheffler, R.M., Preliminary Data Projects on the Status of Physicians Assistants and Medex, University of North Carolina, Chapel Hill, North Carolina, 1976.

3/ Roback, G., and Mason H. R., Physician Distribution and Medical Licensure in the U.S., 1974, American Medical Association, Chicago, Illinois, 1975.

4/ American Nurses' Association, Inc., Definition: Nurse practitioner, nurse clinician, and clinical nurse specialist. Congress for Nursing Practice, May 1974.

As of 1976, there were 198 NP programs in such areas as pediatrics, midwifery, maternity, family practice, adult medicine, and psychiatry. The total consisted of 124 certificate programs and 74 masters programs. Training required in most certificate programs lasts about a year, while the training required for a masters degree generally lasts about two years. About 2,000 nurses, most of whom are female, graduate from these programs each year.

Nurse practitioner students in certificate programs average about 10 years prior experience in professional nursing, with nearly one-half holding hospital diplomas and the majority of the remainder baccalaureate degrees. All masters degree students possess baccalaureate degrees.

Nurse practitioners with certificates come from a wide variety of prior employment settings, including hospital inpatient service departments, community/home health agencies, and health centers. On the other hand, the majority of masters NP's were formerly employed in hospital inpatient service departments. Most employed NP's are in ambulatory practice settings and non-hospital institutional and community settings.

Graduates of formal nurse practitioner training programs are distributed heavily in areas currently undersupplied with physicians. About one-third of the nurse practitioners are employed in inner city areas and another 20 percent in other urban areas; 16 percent are in rural areas and 10 percent in suburban areas. 5/

Future Impacts of PE's

As indicated earlier, the significance of the future PE role lies in the provision of services that can assist in increasing physician productivity, in providing access to care, and in helping contain costs. For PA's, their major role revolves around their potential for achieving physician productivity gains. One major parameter in estimating potential productivity is the extent to which physician assistants may actually be available and employed in the future.

5/ State University of New York at Buffalo, Preliminary Results: Survey of Nurses in Extended Roles, October 1976.

While there are a number of studies which show a high potential acceptance of PA's, there is reason to believe that the small supply of PA's and the newness of the field may inhibit complete nationwide acceptance of these workers. Even more than possible supply constraints and applicable to all PE's, there may also be an inability or unwillingness of some physicians or health care organizations to utilize such personnel, taking into account the malpractice uncertainties, the legal constraints, the administrative responsibilities, the reimbursement questions, the diverse definitions of function, the different education experiences, and, ultimately, the uncertain economic viability of such personnel.

The questions raised above imply that the feasibility of widespread utilization of PE's in the future may be questionable, especially for physician assistants. A major barrier to PE utilization concerns the reimbursement for services under Medicare and Medicaid. At the present time, the only PE services that are reimbursable are generally those which are medically delegated by the physician. This policy is a potential deterrent to the full use of PE skills, and particularly to their use in medically underserved areas or facilities, such as in satellite clinics where full-time medical services are unavailable. In addition, physicians are unlikely to provide physician assistant services for which they cannot be reimbursed or to hire PA's in cases where they are not fully convinced of the advantages of employing such personnel. As a consequence, use of PA's to provide improved access to the health care delivery system could very well be hampered.

Recent revisions of Federal and State laws and State practice acts appear to be designed to lessen the restrictions on use of PE's, both physician assistants and nurse practitioners. In particular, the Rural Health Clinics Services Act authorizes reimbursement for PE services provided in certain rural health clinics, whether or not a physician is physically present at the time the service is provided.

The entire issue of the use of PE's is presently under consideration by a specially formed group of the Graduate Medical Education National Advisory Committee (GMENAC), set up by the Secretary of DHEW to examine the specialty and geographic distribution of physician specialists. In this context, the non-Physician Health Care Provider Workshop of GMENAC is investigating PE productivity and the relationship of that productivity to practice setting and to physician and patient characteristics. The investigation is to include an analysis of the PE's potential for ameliorating present uneven distribution of primary care services, their predilections to choose underserved areas for practice, the quality of care they render, the impact of reimbursement procedures on their utilization, their use by the National Health Service Corps, and the possible effects of National Health Insurance on the costs of and demands for physician extenders.

Despite the uncertainties of the current situation and the lack of historical data and experience on which to base reliable estimates of the future supply of and requirements for PE's, and thus their impact on the provision of health care services, a number of attempts have been made to estimate the potential future impact of PE's.

Estimates of the supply of certificate and masters nurse practitioners, physician assistants, and Medex, which include only those formally trained, have been analyzed, with some tentative conclusions reached as to the future of these fields and their possible roles in the health care system. Using data on the age and sex distribution of the active, credentialled supply, annual estimates of new entrants, and assumptions as to the number, length and mix of programs, student attrition, differing levels of Federal funding, and estimates (provided by individual program directors) of future graduates in light of such funding, projections of the supply of PE's have been made. Three separate estimates (basic, high, and low) are presented here, based on alternate assumptions as to Federal funding of such programs. These are: 1) that Federal funding would continue at its present level through 1990; 2) that Federal funding would be reduced as of 1980, resulting in the halving of the number of graduates in 1982; or 3) that Federal funding would be increased in 1980 so as to triple the number of graduates as of 1982. (Separations from the projected manpower pool for reasons of death, retirement, and temporary absence were estimated annually based upon survey data.)

The supply projections are displayed in Table IV-10. 6/ As can be noted, there is an extraordinarily wide range of possible supply levels, reflecting partially the uncertainty associated with the future utilization of PE's and attitudes toward task delegation, the

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6/ It is important to bear in mind that these estimates relate only to formally trained physician extenders, and not to the total supply of such workers.

newness of these fields, and the critical importance of Federal education, reimbursement, and other health care policies. On any basis, however, it appears that an increased supply of physician extenders could be a factor in the provision of medical services in the future.

The degree to which PE's, and especially physician assistants, can indeed increase productivity and thus reduce the need for physicians was discussed in general earlier. Although no attempt is made to this report to systematically quantify the potential impact, an illustrative example may serve to indicate that potential. For example, if the supply of PE's should reach the basic level indicated--41,550 in 1990--and the assumption is made that each PE can increase physician productivity (measured in visits per year) by one-third, the available supply would be capable of increasing services by an amount equal to approximately 14,000 physicians. Similarly, if it were assumed that each PE could increase physician productivity by one-half, the potential net gain would be equal to about 20,000 physicians.

In many respects, a potential productivity gain equivalent to 14,000 or 20,000 physicians is not insignificant. However, in view of the anticipated 1990 supply of nearly 600,000 physicians, this would represent a gain of only about 2 or 3 percent in services. Although this would be a step in the right direction, it clearly would not be the total answer to the major issues of health care costs, productivity, etc. Furthermore, even the very large supply growth assumed in these examples is problematical and will require extensive efforts and major policy decisions to bring about. On balance, then, increased utilization of PE's holds promise for improving access to medical care, increasing physician productivity, and helping contain costs, but many issues and problems related to PE utilization will have to be addressed on their own in the coming years before their final potential can be realized.

Table IV-1. Trend in number of active physicians (M.D.) engaged in primary care, selected years 1963-75

	1963	1966	1968	1970	1972	1974	1975
Total active M.D.'s 1/	261,728	285,857	296,312	310,845	320,903	330,266	340,280
Primary care	125,367	131,130	134,777	136,637	143,154	147,418	152,365
General practice 2/	66,875	63,903	61,578	57,948	55,348	53,997	54,557
Internal medicine	30,434	35,315	38,532	41,872	47,994	51,752	54,331
Pediatrics	12,762	14,939	16,650	17,941	19,610	20,682	21,746
Obstetrics/gynecology	15,296	16,973	18,017	18,876	20,202	20,987	21,731
Other medical specialties	12,291	14,045	15,762	17,401	16,549	17,485	19,010
Surgical specialties	52,449	59,205	63,803	67,166	70,856	72,399	74,284
Other specialties	71,621	81,477	81,970	89,641	90,344	92,964	94,621

1/ Excludes physicians not classified: 1970-358, 1972-12,356, 1974-20,343, 1975-26,145

2/ Includes family practice 1970, 1972, 1974, 1975

Source: Annual Reports on Distribution of Physicians in the U.S. by the American Medical Association.

Table IV-2. Trend in number of active primary care physicians (M.D.'s) per 100,000 population selected years 1963-75

	1963	1966	1968	1970	1972	1974	1975
Total active M.D.'s	134.8	141.8	144.0	148.3	150.7	152.7	156.8
Primary care	64.6	65.0	65.5	65.2	67.2	68.2	70.2
General practice	34.4	31.7	29.9	27.7	26.0	25.0	25.1
Internal medicine	15.7	17.5	18.7	20.0	22.5	23.9	25.0
Pediatrics	6.6	7.4	8.1	8.6	9.2	9.6	10.1
Obstetrics/gynecology	7.9	8.4	8.8	9.0	9.5	9.7	10.0
Other medical specialties	6.3	7.0	7.7	8.3	7.8	8.1	8.8
Surgical specialties	27.0	29.4	31.0	32.1	33.3	33.5	34.2
Other specialties	36.9	40.4	39.8	42.8	42.4	43.0	43.6

For sources see Table A-IV-2

Table IV-3. Growth Of Group Practice: Number Of Groups,* Number Of Group Physicians And Percentage Of All Non-Federal Physicians, 1932-1975

	Type of group		
	Number of Groups	Number of group Physicians	Percent of all active non-federal physicians
1932	229	1,466	0.9
1940	335	2,093	1.2
1946	368	3,084	2.6
1959	1,546	13,009	5.2
1965	4,289	28,381	10.2
1969	6,162	38,834	12.8
1975	7,733	59,809	18.5

* For purpose of comparison, the current AMA definition of group practice was adjusted to require at least three full-time physicians.

Source: (a) Special tabulations, Center for Health Services Research and Development, American Medical Association, Chicago, 1976.
(b) Milton I. Roemer, "The Ecology of Medical Group Practice in the U.S. "Medical Care XII:8, 1975, p.628.

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Table IV-4. Number and percent of active non-Federal D.O.'s by spececialty, December 1957, and December 1976.

	1957		1976	
	Number	Percent	Number	Percent
Total active	9,622	100.0	13,982	100.0
Primary care	8,916	92.7	8,216	58.7
General practice 1/	8,775 2/	91.2	7,639 2/	54.6
Internal medicine	104	1.1	436	3.1
Pediatrics	37	0.4	141	1.0
Surgical specialties	480	5.0	1,169	8.4
Other specialties	226	2.3	4,597	32.9

1/ Includes family practice for 1976.
2/ Includes 1,414 D.O.'s whose practice is limited to manipulative therapy in 1957, and 540 in 1976.

Source: A Statistical Study of the Osteopathic Profession, December 31, 1957. Chicago, American Osteopathic Association, 1958. Osteopathic Medical Manpower Information Project Draft Report. The American Association of Colleges of Osteopathic Medicine, HRA Contract No. 231-75-0615, May 20, 1977.

Table IV-5. **Foreign medical graduates as a percent of new licentiates, as a percent of filled residencies, and numbers of new entry aliens by visa status, in comparison with U.S. graduates; selected years 1966-1975**

Year	FMG's as percent of total new licentiates	FMG's as a percent of total filled residencies	New entry immigrants	Exchange visitors	H visa	Total new entries	U.S. graduates
1966	18.5	30	2,075	4,370	183	6,628	7,574
1967	22.9	32	2,484	5,264	367	8,115	7,743
1968	22.4	32	2,408	5,701	296	8,405	7,973
1969	23.1	33	2,180	4,460	299	6,939	8,059
1970	27.3	33	2,265	5,008	357	7,630	8,367
1971	35.2	32	2,846	4,784	249	7,879	8,974
1972	46.0	32	2,754	3,932	338	7,024	9,551
1973	44.4	30	2,979	4,614	530	8,123	10,391
1974	40.0	29	2,908	4,717	727	8,352	11,588
1975	35.0	NA	3,898	2,849	569	7,316	12,714

Source: Licensure data for 1966-1972 are derived from Licensure Statistics for 1973, Council on Medical Education, AMA, 1974. Licensure data for 1973 and 1974 are found in Physician Distribution and Medical Licensure in the U.S., 1974, AMA.

Immigration data are obtained from Rosemary Stevens, "Physician Migration Reexamined", Science, 1975. Yearly graduates of U.S. medical schools and licensure data for 1975 were obtained from "Medical Education in the U.S., 1975-76", JAMA, December 27, 1976.

Table IV-6. Physicians admitted to the United States

FY 1970 – FY 1975

	1970	1971	1972	1973	1974	1975
Immigrant Physicians:						
Total Admitted	3,158	5,756	7,144	7,119	4,537	5,361
Beneficiaries of Occupational Preference – Total	840	1,484	1,671	1,729	1,685	1,902
Third Preference						
Admissions	544	564	540	676	663	953
Adjustments	166	557	840	948	761	653
Sixth Preference						
Admissions	84	90	44	17	79	67
Adjustments	46	273	247	88	182	229
All Others	2,318	4,272	5,473	5,390	2,852	3,459
Non-Immigrant Physicians:						
Total Admitted	5,365	5,191	4,283	5,166	5,517	3,466
Distinguished Merit and Ability	83	178	231	350	578	426
Other Temporary	100	47	25	–	–	–
Trainees	174	173	82	178	149	143
Exchange Visitors	5,008	4,784	3,935	4,613	4,717	2,849
Transferees	–	9	10	25	73	48

Source: Table 8A, Annual Reports, selected years. Immigration & Naturalization Service.
Table 16B, Annual Reports, selected years. Immigration & Naturalization Service.

Table IV-7. Selected minority group enrollment in first year classes in U.S. medical schools, 1971-72 through 1975-76 and in osteopathic schools, 1974-75 through 1976-77

Academic year	Total first-year enrollments	Total minority first-year enrollment		Afro-American		American Indian		Mexican American		Mainland Puerto Rican	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
					M.D.'s 1/						
1971-72..	12,361	1,063	8.6	882	7.1	23	0.2	118	1.0	40	0.3
1972-73..	13,726	1,172	8.5	957	7.0	39	0.3	137	1.0	44	0.3
1973-74..	14,185	1,270	9.0	995	7.0	41	0.3	170	1.3	56	0.4
1974-75..	14,963	1,491	10.0	1,117	7.5	72	0.5	231	1.5	71 2/	0.5
1975-76..	15,351	1,419	9.2	1,052	6.9	61	0.4	220	1.5	78 2/	0.5
					D.O.'s						
1974-75..	974	33 3/	3.4	26	2.7	1	0.1	6	0.6	0	0.0
1975-76..	1,032	44 4/	4.3	23	2.2	7	0.7	10	1.0	0	0.0
1976-77..	1,088	45 5/	4.1	26	2.4	6	0.6	11	1.0	1	0.1

1/ Data for schools of medicine includes repeaters and those who re-entered.
2/ University of Puerto Rico excluded from count.
3/ Excludes 7 Oriental-Americans and 2 minorities from unspecified groups.
4/ Excludes 15 Oriental-Americans and 4 minorities from unspecified groups.
5/ Excludes 15 Oriental-Americans and 1 minority from an unspecified group.

Source: Medical Education in the United States, 1975-1976. JAMA, December 27, 1976, and prior years. Osteopathic Manpower Information Project, Draft Report. HRA Contract No. 231-75-0615, Chicago, May 20, 1977.

Table IV-8. **Total number of first-year residency positions offered and percent filled (M.D.'s): 1960, 1968, 1974**

Specialty	1960		1968		1974	
	# Offered	% Filled	# Offered	% Filled	# Offered	% Filled
Total	12,622	84	15,365	83	20,405	92
PRIMARY CARE	3,974	77	4,523	85	8,016	96
General Practice	498	73	477	54	181	90
Family Practice	-	-	-	-	1,317	91
Internal Medicine	2,492	88	2,885	90	4,643	98
Pediatrics	984	90	1,161	86	1,875	97
SURGICAL SPECIALTIES	4,361	97	5,347	89	6,210	94
General	2,331	91	2,718	88	2,828	93
Neurological	110	91	129	92	141	91
Ophthalmology	303	95	431	97	509	99
Orthopedic	383	92	443	91	635	96
Otolaryngology	173	88	226	91	285	95
Plastic	52	90	98	92	194	95
Thoracic	100	89	155	88	158	93
Colon & Rectal	15	69	14	43	32	94
Urology	48	80	254	87	327	95
Ob/Gyn	946	93	879	86	1,101	94
OTHER MEDICAL	121	90	297	88	407	94
Pediatric Allergy	8	78	49	84	70	84
Ped. Cardiology	-	-	69	80	70	83
Dermatology	113	90	179	93	267	99
OTHER SPECIALTIES	4,166	76	5,198	74	5,772	84
Anesthesiology	696	79	846	80	787	90
Child Psychiatry	40	70	191	62	376	76
Neurology	196	76	293	85	387	93
Pathology	1,081	70	1,109	60	1,004	80
P.M. & R	103	53	161	60	166	73
Psychiatry	1,379	79	1,657	73	1,773	88
Nuclear Medicine	-	-	-	-	72	73
Forensic Path.	-	-	-	-	48	50
Neuropathology	-	-	-	-	40	-
Radiology	671	81	941	90	294	76
- Therapeutic	-	-	-	-	165	73
- Diagnostic	-	-	-	-	660	84
Miscellaneous	-	-	-	-	-	-

Source: Supply and Distribution of Physicians and Physician Extenders, a background paper prepared for the Graduate Medical Education National Advisory Committee, MSUB/DM/BHM/DHEW, Washington, D.C., March 1, 1977.

Table IV-9. Number and percent distribution by specialty of first-year residents, 1960, 1968 and 1974.

	Total number and percent distribution of first-year residents (M.D.'s), 1960 1968, and 1974						Percent growth between 1960 and 1974 and between 1968 and 1974	
	1960		1968		1974			
Specialty	Number	Percent	Number	Percent	Number	Percent	Percent growth 1960-1974	Percent growth 1968-1974
Total	11,080	100.0	12,864	100.0	18,834	100.0	70	46
Primary care	3,443	31.1	3,796	29.5	7,724	41.0	124	104
General practice	364	3.3	258	2.0	162	.9	55	37
Family practice	-	-	-	-	1,199	6.3	-	-
Internal medicine	2,193	19.8	2,589	20.1	4,553	24.2	108	76
Pediatrics	886	8.0	949	7.4	1,810	9.6	104	91
Surgical specialties	4,274	38.6	4,754	37.0	5,852	31.1	37	23
General surgery	2,122	19.1	2,394	18.6	2,639	14.0	24	10
Neurological surgery ...	101	.9	119	.9	129	.7	27	8
Ophthalmology	288	2.6	418	3.2	504	2.7	75	21
Orthopedic surgery	353	3.3	403	3.1	609	3.2	72	51
Otolaryngology	153	1.4	206	1.6	270	1.4	76	31
Plastic surgery	47	.4	90	.7	184	.9	292	104
Thoracic surgery	89	.8	137	1.1	147	.8	65	7
Colon & Rectal	-	-	6	.1	30	4.8	-	500
Urology	204	1.8	222	1.7	310	1.6	52	40
Obstetrics and gynecology	917	8.3	759	5.9	1,030	5.5	12	36
Other medical specialties .	102	.9	259	2.0	381	2.0	-	47
Pediatric allergy	-	-	39	.3	59	.3	-	51
Pediatric cardiology ...	-	-	54	.4	58	.3	-	7
Dermatology	102	.9	166	1.3	264	1.4	459	59
Other specialties	3,261	29.4	4,055	31.5	4,877	25.9	50	20
Anesthesiology	550	5.0	677	5.3	715	3.8	30	6
Child psychiatry	-	-	99	.8	287	1.5	-	190
Neurology	149	1.3	249	1.9	381	2.0	156	53
Pathology	757	6.8	661	5.1	807	4.3	7	22
Physical medicine and rehabilitation	55	.5	95	.7	122	.7	122	28
Psychiatry	1,090	9.8	1,209	9.4	1,564	8.3	30	23
Nuclear medicine	-	-	-	-	53	.3	-	-
Forensic pathology	-	-	-	-	24	.1	-	-
Neuropathology	-	-	-	-	26	.1	-	-
Radiology	554	5.0	849	6.6	225	1.2	59	73
Therapeutic	-	-	-	-	120	.7	-	-
Diagnostic	-	-	-		553	2.9	-	-
Miscellaneous	106	1.0	216	1.7	-	-	-	-

Source: Supply and Distribution of Physicians and Physician Extenders, a background paper prepared for the Graduate Medical Education National Advisory Committee, MSUB/DM/BHM/DHEW, March 1, 1977.

Table IV-10. Present and projected supply of physician extenders (physician assistants and nurse practitioners): 1975, 1980, and 1990

	1975	1980	1990		
			Basic	Low	High
Total physician extenders................	7,640	18,840	41,550	29,040	57,590
Total physician assistants (PA's)...............	2,540	7,410	18,520	13,200	27,700
Physician assistants.........................	2,100	6,550	16,640	11,790	26,440
MEDEX.......................................	440	860	1,880	1,410	2,860
Total nurse practitioners (NP's)................	5,100	11,430	23,030	15,840	29,890
NP certificate................................	3,800	8,270	15,680	11,140	20,210
NP masters..................................	1,300	3,160	6,350	4,700	9,680

Source: Supply and Distribution of Physician Extenders, GMENAC Staff Paper No. 2, prepared for The Graduate Medical Education National Advisory Committee. DHEW Publication No. (HRA) 78-11, by the Division of Medicine, Bureau of Health Manpower. Estimates on physician assistants are individual program director's estimates of 1974-1980 enrollment. Nurse Practitioner estimates are from Characteristics of Trainees and Graduates of Nurse Practitioner Programs, State University of New York.

Note: Numbers may not add to totals due to rounding.

V. DENTISTRY

Among the health professions, dentistry ranked fourth in numbers of trained health personnel, following nursing, medicine, and pharmacy. Although the number of dentists has increased steadily since 1950, the dentist-to-population ratio actually declined from 1950 to 1965, and increased very slowly since then, reaching a level in 1975 only slightly higher than that in 1950.

The overwhelming majority (nine out of ten) of active dentists practice in a non-institutional setting. There are eight recognized dental specialties, but only 10 percent of the Nation's active civilian dentists are specialists.

There are few women dentists in the United States, and a sizable proportion of them work part-time. However, in proportion to their number, the representation of women dentists on the faculty of dental schools is more than three times that of male dentists. In the present decade, there has been a sharp increase in the enrollment of women in dental schools, so that the number and the proportion of female dentists are expected to rise in the future.

Minority group representation among dentists is expected to increase somewhat, since the enrollment of minority students in dental schools has shown a fairly steady and consistent increase during the present decade.

Dentistry, which has many similarities to medicine, also differs significantly from that profession. The procedure for obtaining a State license to practice dentistry is more cumbersome than for medicine, since satisfactory completion of both a written test and a clinical examination is required. Licensure by reciprocity or endorsement is considerably more limited for dentists than for physicians and consequently dentist mobility is more restricted. In the dental educational setting, clinical teaching facilities are virtually all located in the dental school itself; external sites for the efficient teaching of dental clinical skills are essentially non-existent.

The geographic distribution of dentists is a major concern, as more than 80 percent of the counties in the United States have persons-to-dentist ratios less favorable than the national average of about 2,000 persons per dentist. The average number of dentists per 100,000 population diminishes from a high of 56 for all metropolitan areas to only 26 for counties with a central city of less than 5,000 population.

The number of schools of dentistry and their enrollments have increased substantially since the mid-1960's, with the increase attributable largely to provisions of the Health Professions Educational Assistance (HPEA) Act of 1963.

Growth in prepaid dental insurance, increases in multiple-practitioner relationships, and the increasing use of dental auxiliaries, are major factors that are expected to affect the nature and the scope of dental practice in the future. However, if the current level of production of dental manpower is maintained, supply and demand are projected to come into balance in the late 1980's.

Number and Characteristics of Dentists

There were approximately 115,000 active dentists in the United States at the end of 1976, of whom 110,000 were civilian dentists in the 50 States and the District of Columbia and 5,000 were dentists in the Armed Forces (Table V-1).

In 1976, the median age of active dentists was 41.7 years. This figure is slightly lower than the comparable figure for earlier years of this decade, primarily because of the increase in the number of dental graduates. Almost one third (36,610) of the active dentists are under 35 years of age, including 16 percent who are under 30 years of age (Table V-2). About one fifth of the active dentists are 55 years of age or over, including 9 percent (10,430) who are age 65 and older.

In 1950 there were some 75,000 active civilian dentists, providing a ratio of 49.8 dentists per 100,000 population. Even though the supply of dentists increased steadily in subsequent years, the dentist-to-population ratio gradually declined until, in 1965, it reached a low of 46.5 dentists per 100,000 population. After that year, the unfavorable trend was reversed and the ratio slowly increased, until, by 1976, the dentist-to-population ratio was 51.4, slightly higher than the level in 1950.

The great variation in dentist-to-population ratios among regions and States is very evident as shown in Table V-3. In 1976, among the regions, the Northeast and the West had the highest ratios, each with 62 active civilian dentists per 100,000 population, while the South, with 41, had the lowest ratio. Among individual States, New York had a ratio of 70 dentists per 100,000 population, the highest in the Nation. Four other States had ratios of 65 or more active civilian dentists per 100,000 population--Washington, Oregon, Massachusetts, and California. Mississippi had the lowest ratio, with only 30 dentists per 100,000 population.

in 1976 there were 1,570 female dentists in the United States, representing 1.4 percent of all active civilian dentists (Table V-4). The distribution of female dentists was very uneven, both by geographic division and by State. In New England, 1.7 percent of the active civilian dentists were female--the highest proportion in any geographic division. The Mountain States had the lowest proportion, with 0.7 percent. More than one third of all women dentists (597) were concentrated in three States--California, New York, and Illinois. In many States the number of female dentists was minimal; 24 States had less than 10 women dentists each.

The American Dental Association (ADA) formally recognizes eight areas of dental practice as constituting specialty practice. There was a comparatively rapid increase in the number of dental specialists in the 1950's and 1960's, and the annual increases continued during the early 1970's, although at a much reduced rate. Nevertheless, the 10,828 specialists practicing in 1976 constituted only 10 percent of the Nation's active civilian dentists (Table V-5). This ratio of one dental specialist to nine dentists in general practice is in sharp contrast with the situation in the medical profession where four of every five physicians are specialists.

In 1976 over two-fifths of all dental specialists, or close to 4,500, limited their practice to orthodontics. The next largest group, almost 2,800, specialized in oral surgery. Pedodontists comprised the third largest specialty group with some 1,200 dentists, followed rather closely by periodontists with about 1,000. A total of 1,335 dentists, or 12 percent of the total number of specialists, were in the other four specialties combined.

A comparison of the figures for male and female dental specialists reveals that there are proportionately more female dentists than male dentists in the specialties of orthodontics, pedodontics, and periodontics; 93 percent of all female dental specialists are in these three specialties. Female pedodontists account for 34 percent of all female specialists, while only 11 percent of male specialists are pedodontists. On the other hand, there are practically no female dentists in oral surgery, while one-fourth of the male specialists are in this field. Overall, female dental specialists are 7 percent of all female dentists, a proportion somewhat less than that for male dentists.

In 1976 the United States had 5.1 active dental specialists per 100,000 civilian population (Table V-6). By geographic division, the Pacific States had the best supply of dental specialists, with a ratio of 7.6 per 100,000 population, while the West South Central division had the lowest ratio, with 3.7 specialists per 100,000 population. Among the individual States, Washington had the highest ratio, 9.3 per 100,000, followed by California, New Jersey, and Massachusetts, each with ratios of 7.0 or more. At the other end of the spectrum, four States had a ratio of less than 2.0 dental specialists per 100,000 population. This considerable variation in the distribution of dental specialists is, to some extent, accounted for by the tendency of specialists to locate not only in large metropolitan areas but also in areas which have dental schools.

The graduates of foreign dental schools have never been a significant factor in the Nation's supply of dentists. Only about 600 foreign dental graduates were licensed to practice in the United States between 1970 and 1975, and about two-thirds of these dentists were licensed by two States--New York and California. In earlier years, all foreign dental graduates (except graduates of Canadian dental schools) were required to obtain a degree from a dental school in the United States before they could obtain a license to practice dentistry in this country.

Characteristics of Dental Practice

Approximately 88 percent of all active dentists practice either full-time or part-time in a non-institutional setting (Table V-7). A further breakdown shows that 79 percent practice 30 or more hours a week, while 9 percent work less than 30 hours per week. The remaining active dentists are distributed among a variety of institutional settings, with the largest portion, 4 percent, in the Armed Forces. Faculty and staff of dental schools account for 3 percent, and 2 percent are interns, residents, or students in advanced dental education.

Dentistry is overwhelmingly practiced in private offices operated by a dentist in solo practice. However, there have been some delivery system changes in recent years, such as health maintenance organizations (HMO's), closed panels, and, most notably, the growth of group practices. Dentists practice primarily in isolation from each other and do not use centralized treatment centers, i.e., hospitals and other institutions, as do physicians. Rather, dentists practice in self-financed private offices, with their own high-capital-cost equipment, and do not usually also practice elsewhere.

There are notable professional differences between male and female active dentists. About one-fourth of all female dentists provide dental services less than 30 hours per week, compared with 9 percent of the male dentists. The contrast is even more pronounced when the ratio of part-time to full-time practicing dentists is considered; almost one-third of the female practicing dentists work part-time, compared with only one-tenth of the male practicing dentists. The proportion of female dentists among faculty of dental schools is more than three times that of male dentists.

Unlike other health professions, in particular medicine and nursing, dentistry does not have an extensive range of allied dental health personnel. Dental hygienists are the only licensed or registered auxiliaries, and they function under the direct supervision of dentists. Other categories of allied dental personnel include dental assistants and dental laboratory technicians. The newest category is expanded function dental auxiliaries (EFDA's); these can be either dental hygienists or dental assistants whose training includes a wide range of clinical functions and direct patient care procedures previously performed only by the dentist. This latter category resembles the physician assistants and, though not yet widely utilized in dentistry, offers a significant potential for increased productivity.

In recent years, the proportion of dentists who use one or more dental auxiliaries has increased steadily, according to the periodic Surveys of Dental Practice conducted by the American Dental Association. By 1975, 96 percent of all independent dentists--an overwhelming majority-- employed at least one auxiliary of some type, a significant increase from the 77 percent in 1955 (Table V-8). (The term "independent dentist," used here and elsewhere in this chapter, includes not only dentists in solo practice, but also dentists working in partnership or group practice; the term excludes all dentists on salary.) Well over 90 percent of the independent dentists employed one or more dental assistants in 1975, an increase of 22 percent since 1955. Much more dramatic, however, is the rise in the percentage of independent dentists employing one or more dental hygienists; this percentage increased from only 10 percent in 1955 to 41 percent in 1975.

There is a strong and direct relationship between the extent of auxiliary utilization and the average number of patient visits per week. This relationship was demonstrated in a national survey conducted in 1968 and 1969 of dentists in general practice. On the average, general practitioners had 67 patient visits per week (Table V-9). The statistical breakdown showed a steady increase in weekly patient visits with each increase in the number of auxiliaries employed. The number of visits varied from 45 visits with no auxiliary, to 60 for dentists with one auxiliary, to 83 with three auxiliaries, and to 95 visits with four or more auxiliaries. If the breakdown is extended to include dentists with seven or more auxiliaries, the number of patient visits per week per dentist rises to 108.

The number of patient visits per week also varies greatly according to the age of the dentist. The average number of patient visits increases from the number for dentists under 40 years of age to the highest patient-visit level for dentists in the age group 40-54. After age 54, there is a noticeable numerical decline in patient visits for every age group. This age-related configuration holds also for every level of auxiliary utilization. Dentists in the age range 40-54 always have the highest number of visits, regardless of the number of auxiliaries utilized.

The 1975 Survey of Dental Practice conducted by the American Dental Association shows that independent dentists work an average of 41 hours per week in a dental office, of which 34 hours are devoted to contact with patients, one and a half hours are used to work on prepayment forms, and three hours are spent on various other office tasks. The remaining two and one half hours per week are used for dental laboratory work.

The same ADA Survey presents the average percent of time per week spent on various office procedures by independent dentists. Operative procedures account for more than 1/3 of the time spent treating patients by all independent dentists. In comparing general practitioners as a group with specialists as a group, certain procedures are performed more frequently by general practitioners than by specialists. For example, general practitioners spent 41 percent of their time on operative procedures while, as expected, specialists (including pedodontists, oral surgeons, periodontists and all others) spend only 8 percent of their time on operative procedures. By contrast, some procedures are characteristically provided by specialists. For instance, orthodontic procedures take less than 4 percent of the time of all general practitioners, but over 40 percent of work time of all specialists, as a group.

The financing of dental care differs significantly from the financing of other types of medical care. For dentistry, the basic financial mechanism is the fee-for-services paid directly to the dentist by the patient. Approximately 6 percent of total health expenditures is spent for dental care. The near-universality of dental disease, along with the ability to defer dental treatment, may lead to an accumulation of need, making dental treatment difficult to insure. Dental insurance more closely resembles a financing or budgeting mechanism than insurance in the traditional sense. In dentistry, dental insurance, or third-party payment plans, are not yet a major market influence as they are in medicine. In this particular respect, dentistry is chronologically about 15 years behind medicine; in 1975, it was estimated that 16 percent of the population had dental benefits, which is closely comparable to the 14 percent covered by major medical benefits in 1960.

Licensure of Dentists

Dentists are licensed by every State and the District of Columbia. Although licensure requirements differ from State to State, Every State requires applicants for licensure to pass a written and clinical pass a written and a clinical examination.

Licenses are issued by a State board of dentistry, composed of from five to 11 members. In all but nine States, board membership is limited to memebers of the dental profession. In recent years, a few States have added public or consumer representatives as members of the State dental board.

Annual renewal of licensure is required in all but 12 States; in those 12 States renewal is biennial. Continuing education is a prerequisite for relicensure in six States. This generally consists of attendance at lectures, seminars, or meetings for a specified number of hours. In another eight jurisdictions, the State dental association requires some form of continuing education to maintain membership in the association.

In recent years, several States have set up procedures to permit some foreign dental graduates to qualify for licensure without first obtaining a degree from an American dental school. At present, 15 States and the District of Columbia have established such procedures, although with considerable variation in the criteria for qualification. All other States require foreign dental graduates to obtain dental degrees from accredited dental schools in the United States or Canada in order to be eligible for licensure. The number of foreign dental graduates seeking licensure is comparatively far less than is the case with foreign medical graduates.

In every State except Alabama and Delaware, all candidates for dental licensure may entirely or partially meet their State's written examination requirement by passing a written examination administered by the National Board of Dental Examiners of the American Dental Association. Some States require an additional State-administered written examination on specific subjects. Such supplementary examinations may consist of a written test on the State's own dental laws, or an examination on various aspects of diagnosis, treatment planning, and preventive dentistry.

Clinical examinations for dental licensure applicants may be administered by the boards of dentistry of the individual States or by regional dental licensure testing boards, of which 32 States are now members. These regional boards conduct simultaneous clinical examinations at locations in one or more of the participating States. By passing such an examination, candidates satisfy the clinical examination requirement of each participating State. There are now four such regional arrangements: the North East Regional Board, with a membership of 15 States; the Central Regional Dental Testing Service, with 11 States; the Southern Regional Testing Agency, with four States; and the recently-organized Western Regional Examining Board, with only two States.

Since passing a simultaneous clinical examination meets the clinical requirement for a number of States, this has the effect of facilitating establishment of a dental practice, or of obtaining initial dental employment, in geographic areas other than the graduates' home State or the State in which they received their dental education. This facilitation for wider distribution of dental manpower may well benefit shortage areas, although there is no assurance that this result will necessarily follow.

Regional clinical examinations constitute a comparatively recent development which has made rapid progress in the past few years. The further establishment and extension of these mechanisms for regional simultaneous clinical examinations may presage an eventual nation-wide clinical examination, comparable to the written examination of the National Board of Dental Examiners.

Some States authorize recognition of the licenses granted to dentists by other States and accept such licensure as evidence of adequate qualification to practice dentistry within their own jurisdiction. Such recognition of out-of-State dental licenses has been adopted by 17 States, and may take the form of an endorsement of the dentist's license when the granting State deems that the applicant meets its own licensure criteria, or may be effected by a reciprocal agreement with the applicant's present State of licensure. However, at present, the practical effect of such mutual recognition is very limited because some States recognize licenses of only a very few other States.

A more extensive recognition of dental licenses would obviously result in greater geographic mobility of dental personnel which, in turn, would increase the potential for manpower redistribution. However, although such redistribution would be greatly facilitated, it does not necessarily assure movement of dental manpower to shortage areas.

Perhaps the greatest benefit that could result from a more free and unhindered movement of dental personnel would be realized through establishment of a regional, or perhaps a national, dental placement system. Such a system would serve both the communities and the dental profession by providing regional and local data on dental needs and opportunities. This system would also facilitate the channeling of dental personnel to underserved areas. However, widespread and significant effectiveness of such placement systems would require a much greater freedom of movement of dental personnel than exists at the present time.

Geographic Distribution of Dentists

Major factors determining the location of dental practices are economic and social. In metropolitan areas there is generally a greater effective demand for dental services and a greater ability to pay for them than is the case in most non-metropolitan counties. As in the case with other health professionals, many dentists settle in or close to urban areas in order to be near centers of social, recreational, and cultural activities.

The metropolitan areas have about three times the population of the non-metropolitan counties but have over four times the number of dentists. Stated another way, the 73 percent of the population in metropolitan areas are served by 81 percent of the dentist work force.

There is a decided variance between the ratios of dentists to population in metropolitan areas and non-metropolitan counties. The average number of dentists per 100,000 population for the Nation is 50 (Table V-18). For metropolitan areas, the average number of dentists is 56 per 100,000 population, and for non-metropolitan counties the average is 34 dentists. Also, in the non-metropolitan counties there is a steady decline in concentration of dentists when these counties are grouped by decreasing size of the central city. For the non-metropolitan counties with the largest central cities (i.e., of 25,000 population and over), the average number of dentists is 43 per 100,000 population, still substantially lower than the average figure for metropolitan areas. The ratio of dentists to population continues to diminish with the decreasing size of the central city until there is an average of only 26 dentists per 100,000 population located in counties with a central city of less than 5,000.

The more favorable distribution of dentists in metropolitan areas over non-metropolitan counties persists when the data are examined by region, division, and State. Moreover, within the category on non-metropolitan counties themselves, the general trend to lower dentist-to-population ratios is evident in the regions and divisions as the size of the central city diminishes. The same general progression exists in a great majority of individual States, but departures from the downward progression do occur in the data for a few States.

Because of variations in demand and characteristics of the work force, the ususal method of establishing a persons-per--dentist ratio is inherently inadequate. However, this method has long been used to define shortages. The 3,076 counties of the United States shows a very great variation in persons-per-dentist ratios. There are 234 counties with no dentist at all (Table V-19), an an additional 579 counties with an unfavorable ratio of 5,000 or more inhabitants per dentist. The national average for all counties is 1,944 persons per dentist. 2,539 counties (83 percent of the total) have persons-to-dentist ratios greater than the national average. The national average is considered to be adequate to meet present demand.

Two programs of the Federal Government directed at the correction of dental manpower maldistribution use a persons-to-dentist ratio as the criterion for designating shortage areas. New dental graduates are eligible for the forgiveness of student loans under the loan repayment program if they agree to serve in counties with 3,000 or more inhabitants per dentist; 551 dentists are now serving in such areas under this program. As of October 1, 1977, the criterion for designation of dentist shortage areas under the student loan program was changed to a ratio of 5,000 persons per dentist. The other Federal program, the National Health Service Corps (NHSC), currently uses that ratio as its criterion and has assigned 97 dentists to work in counties with 5,000 or more inhabitants per dentist.

Large and small communities differ considerably with respect to the average length of time patients must wait before being scheduled to receive dental treatment. As the size of a city or town decreases, the average patient waiting time for dental appointments increases. In towns with populations under 2,500, 20 percent of the independent dentists scheduled patients for an average of a month or more in advance in 1975, compared to only 3 percent of the independent dentists in cities of over 1,000,000 (Table V-20). On the other hand, 21 percent of independent dentists in these largest cities scheduled patients within two days or less, on the average, while only 10 percent of independent dentists in towns under 2,500 accommodated patients so quickly.

Independent dentists in the smaller communities tended to have the heaviest practice loads and to categorize themselves as either overworked or too busy. Almost 48 percent of the detnists in the smallest communities were in these two categories in 1975--23 percent provided dental care to all patients who requested appointments but felt overworked, i.e., they were too rushed or were working too many hours or both, and another 25 percent were too busy to treat all persons who sought appointments (Table V-21). In contrast, only 24 percent of independent dentists in cities of more than 1,000,000 categorized themselves as either overworked or too busy. Nearly one-half of the independent dentists in the largest cities said that they had enough patients, but not too many, while an additional 27 percent would have liked to have more patients.

Dental Education

The present number of schools of dentistry and their student enrollment represent a considerable increase over the figures for previous decades. The number of dental schools has increased from 42 in 1950 to 59 in 1976 (Table V-11). In this same period, total enrollment rose from 11,891 to 21,013 students, an increase of over 75 percent. From the mid-1960's onward, increases in the number of dental schools and in dental school enrollment are, in large part, attributable to provisions of the Health Professions Educational Assistance (HPEA) Act, which included provisions for construction of new schools and for expansion of the capacity of existing schools of dentistry. Even though two schools closed in the early 1970's, the opening of new schools has provided a net increase of 10 schools since 1965.

From 1950 to 1965, total enrollment showed a rather modest increase of some 2,000 students, reaching a total of 14,020 in 1965. After 1965, the impact of the HPEA Act began to be evident. By 1976, total enrollment had increased by about 7,000, a full 50 percent above the 1965 level. There is, of course, a similar contrast between the earlier and later periods relative to first-year enrollment. During the period 1950-1965, first-year enrollment increased only by about 600 to some 3,800. By 1976, first-year enrollment totalled 5,935, an increase of more than half over the total in 1965.

During most of the 1960's, the number of dental graduates remained fairly steady, ranging from about 3,200 to about 3,400 a year. By the end of the 1960's, the number of graduates began to rise noticeably, with 3,749 dentists graduating in 1970. Thereafter the increase accelerated; reaching a total of 5,336 dental graduates in 1976, an increase of 42 percent over the 1970 level.

Total enrollment, the number of first-year students, and the number of graduates for 1976 are given in Table A-V-1 for each of the 59 dental schools in the United States and Puerto Rico. In 1950, only six dental schools had as many as 100 graduates. By 1976, as a result of programs to expand dental school capacity, 24 schools had a graduating class of 100 or more.

Although there has been a great increase in the training capacity of dental schools in the United States in recent years, there are still 18 States which do not have a dental school. Of these, 14 have entered into compact agreements with dental schools to subsidize the dental education of students from their State, primarily by the paying of part of the students' tuition. The number of dental schools which have entered into such compacts averages five per participating State. In addition, nine States which do have dental schools have also entered into compact agreements to provide support to students from their own areas who are enrolled in dental schools in other States. In the current academic year, 1976-77, these agreements between States and dental schools are facilitating the education of about 1,000 students, some of whom would be otherwise unable to obtain a dental education. Moreover, the States that are providing support to students through compact arrangements may be increasing the number of dentists likely to settle and practice within their boundaries.

Minorities and Women in Dental Schools

The enrollment of minority students in dental schools during the 1970's shows a rather steady and consistent increase. First-year minority enrollment increased from 412 in the academic year 1971-72 to 650 in 1976-77, an increase of 58 percent (Table V-12). Minority students, as a proportion of all first-year dental students, increased from 9 to 11 percent in that period. The actual extent of minority gain is not immediately evident in these percentages, because the overall first-year enrollment also rose 25 percent during this same period. However, the increase in the number of first-year minority students was proportionately more than twice the percentage increase in total first-year enrollment.

In 1971-72 minority students constituted only 6 percent of the total enrollment in dental schools; by 1976-77 this proportion had increased to 10 percent, or 2,099 students (Table V-13). Although Blacks are by far the largest minority group with 955 students, they still comprise less than 5 percent of the total enrollment in dental schools. Orientals follow with 3 percent and Mexican-Americans with 1 percent. All other minorities combined constitute another 1 percent of the total enrollment. A breakdown of the 1976-77 enrollment of minority students by class year also shows a steady increase in numbers. In the fourth-year class there are 426 minority students; each earlier class has a progressively greater number, with 650 in the first-year class. Another significant indication of the extent of the increase in minority students in dental schools is the fact that, in 1976, minority graduates constituted 9 percent of all graduates, nearly double the proportion in 1972.

One of the most notable and significant developments in dental education in the 1970's has been the rapid and steep increase in enrollment of women students. In academic year 1976-77, there were 802 female first-year dental students, more than an eight-fold increase since 1970 (Table V-14). Over this same period, female dental students, as a proportion of all first-year enrollments, increased from 2 percent to nearly 14 percent.

The substantial increase in enrollment of women is also evident in the statistics for total dental student enrollment. In academic year 1970-71, there were 231 female dental students, only about 1 percent of the total. In academic year 1976-77, female enrollment totaled 2,349, constituting a full 11 percent of all dental students in the United States (Table V-15). This upward trend is similarly evident in the breakdown of the 1976-77 enrollment of female dental students by class year. Fully one-third of the female dental students are in the first- year class. In contrast, women students in the fourth-year class represent only one-sixth of the total female enrollment in dental schools. The number of women graduating from schools of dentistry has increased substantially since 1972. In that year, there were only 40 female graduates; in 1976, 248 women were graduated from dental schools in the United States.

Projections of Dental Student Enrollment and Graduates

The data in Table V-16 show that student enrollment and the number of dental graduates in the immediate future will increase less rapidly than during the last several years. Increases in recent years are due largely to Federal support for dental school expansion and new school construction and, with the decline in such support, the upward trend of both schools and students is approaching a halt.

Dental student enrollment projections for the next decade indicate that the number of students will remain very close to the 1976-77 level. First-year enrollment is projected, after minor fluctuations, to decrease slightly, from 5,935 in 1976-77 to 5,900 in 1978-79. Subsequent first-year enrollments are projected to continue at that level, resulting in a stabilization of the number of graduates at about 5,460 by 1981-82. These projected levels for graduates are expected to prevail through the academic year 1989-90.

The present number of dental schools is projected to increase by only one during the projection period. The scheduled enrollment of the first dental class at Oral Roberts University in Oklahoma in the academic year 1978-79 will increase the total to 60 dental schools.

The small increase in the number of graduates in the 1977, 1978, and 1980 graduating classes is due chiefly to the fact that several dental schools which had three-year programs are returning to the traditional four-year program. During the early 1970's a number of dental schools changed their curriculums to compress the four academic year-four calendar year (4-4) program into a four academic year-three calendar year (4-3) program, in order to accelerate the production of dental personnel. At one time there were 14 dental schools with such 4-3 programs. There is now a definite trend back to the 4-4 arrangement and it is expected that by 1978-79 there will be only six 4-3 programs. This means that a few schools will each skip a graduating class in one of the upcoming years as they are phased back to a 4-4 program.

Graduate Dental Education

In 1976, there were 3,508 students in some type of advanced dental education beyond the dental degree (Table V-17). The first-year enrollment in all such programs was 1,904, of whom 733 students were in general practice residencies and 1,171 in training programs for dental specialties. Of the first-year dental specialty students enrolled in dental schools, the largest numbers were in orthodontics and periodontics. The largest enrollment in the non-dental school specialty programs was in oral surgery. In 1976, 1,930 students were graduated from all programs of advanced dental education, including both general practice and specialty programs.

In the last five years, first-year enrollment in general practice residencies increased considerably, while the first-year enrollment for specialty programs held at about the same number. Indeed, the number of students in specialty programs in the academic year 1976-77 (1,171), constituted a slight decline from the 1,203 enrollment in 1971-72. In contrast, the increase in general practice residencies from 516 in 1971-72 to the 733 students in 1976-77 represents a gain of 42 percent.

Projections of Dentist Supply and Requirements

The present status of dental manpower has been previously described and, in this section, projections are made of the anticipated future supply of and requirements for dental manpower. Recognizing that the future is difficult to predict with assurance, it is concluded that, if the current level of production of dental manpower can be maintained, supply and demand are projected to come into balance in the late 1980's. The dental manpower requirement projections presented are based on assumptions made about the developing trends in dentistry. To the degree that these assumptions might prove to be in error, the manpower projections based on them become more problematic.

The events and conditions underlying supply and demand will be discussed separately. The factors to be discussed under supply are engineering or technical advances and organizational changes in the delivery of dental services. Those to be considered under demand are preventive dental health practices and third-party payment.

Engineering advances have had significant effects on the delivery of dental services by increasing the productive capability of the Nation's dentists through innovations in equipment, materials, and techniques. However, the rate of gain in dental treatment production resulting from engineering innovations during the past 20 years has leveled off in recent years. Engineering improvements in dental practice technology that are in the development at this time are not likely to provide similar large gains in dentists' productive capability in the near future. The diminished rate of technological advance has been largely supplanted by recent advances in the organization of dental office practice, especially those manifested by the greater use of dental auxiliaries. The potential for further increasing the output capability of dentists through the use of expanded-function dental auxiliaries (EFDA's) is thought to be especially great. However, whether or not these gains will be realized in the future is dependent on a number of factors, the bases of which are primarily economic.

The supply of dental services is highly responsive to economic conditions in terms of the elasticity of supply relative to the price of services. This implies that, as demand changes, dentists have quite a bit of flexibility in changing the output of their services. It is anticipated that the major response to increases in demand for dental services will be manifested in dentists' increased use of conventional auxiliaries. Moreover, when it appears to be in the dentists' best economic interest, a relaxation of restrictions on the scope of delegated functions can be expected, with an increased demand for and employment of trained expanded-function dental auxiliaries.

Dentistry has not experienced the extreme cost inflation that has characterized some other components of the health-care market. For example, the 1975 Consumer Price Index for dentistry was 161.9, compared with 161.2 for all consumer items, and 179.1 for all medical services. The demand for dental care is quite sensitive to changes in price. This fact is supported by the observation that, as measured in real dollars, the cost of operating a dental practice increased 100 percent between 1967 and 1975, while dental fees increased by only 62 percent. The demand for dental care is price elastic, and it is believed that an increase in price results in an exodus of consumers from the market. However, evidence does not support the opposite conclusion, i.e., that a decrease in price will create an equal increase in demand. It is commonly held that going to a dentist is a consumer habit that must be developed and cultivated over time. Therefore, based on the elasticity of demand relative to price, dentists would be expected to be somewhat vulnerable to changes in the state of the national economy.

It can be reasoned that projections of demand should take into account the proven dental health benefits that accrue primarily from optimally fluoridated community water supplies. Although the beneficial effects of fluoride are well established for children and young adults, there is less certainty about the effect on dental care needs and demands that will be produced by extending the healthy condition of more of the natural teeth of older adults. This extension of the life of natural teeth in adults might result in a greater number who will be enjoying the obvious advantages of natural teeth longer, but could also be potentially subject to periodontal disease, and be at risk to further incidence and progression of tooth decay. The prevention of periodontal disease is dependent primarily upon personal oral hygiene habits of the individual and regular periodic attention by the dentist. It may be that, as the need for restorative work declines among children and younger adults, the periodontist and general dentist will find their time requirements reduced for those age brackets, while the periodontist and endodontist may find that their services are more in demand by adults who have retained more of their natural teeth into later years. Until more explicit information on adults is developed, it will be difficult to predict the total effect of universal optimal fluoridation and other preventive measures on dental manpower requirements. Consequently, the demand projection should not be altered at this time on the basis of anticipated changes or improvements in dental disease prevention.

The validity of dental manpower projections rests significantly on the assumption that the market for dental services will remain competitive, as the proportion of the population covered by dental benefits increases, because the economic model used to make the projections is based on the assumption of market clearing through price adjustment. While this assumption is quite tenable for past and present levels of dental prepayment coverage in the population, its validity will grow increasingly suspect if, as the proportion of the population covered by dental prepayment increases, the price of dental services loses its function as the mechanism which equilibrates the supply and the demand for dental services. The fact that price does not serve this function in the market for hospital services, where 80 percent of the population has some type of "insurance" coverage, is seen to be a major contributor to the runaway inflation in that industry. The market for physicians' services suffers from the same problem, but to a lesser extent. If, as the extent of dental prepayment expands in the future, the role of price in the market for dental services is eroded in the same way that it has been in the market for physicians' services and for hospital services, then the future state of the dental service market will grow more uncertain and less predictable.

It should be particularly noted that the projections made in this report do not account for significant changes in the structure of the dental market place, i.e., the establishment of a comprehensive dental benefit program for the entire population under a national health insurance program. Because of economic considerations, the enactment of such a program in the near future appears doubtful; however, should such a program be enacted, it would have significant dental manpower repercussions which should be taken into account in the design of the program.

Future numbers of dentists that will be required in the United States have been estimated on the basis of projections of the demand for dental services. Requirements are calculated as the number of dentists who are needed to enable the supply of dental services to keep up with the demand without inflation in the price of dental services.

From the national aggregate point of view, there has been a shortage of dentists in the United States since the mid-1960's, as manifested by a slightly faster rise in the average price of dental services than the rate of increase in the general price level. Inflation in dental prices is due, in large part, to the accelerated growth of dental prepayment plans, which have caused demand for dental services to grow at a faster rate than supply. However, the health manpower legislation of the mid-1960's seems to have anticipated the increased demand very well, and there has been a concurrent increase in the output of dental personnel.

A slight shortage of dentists is projected to persist through 1980 and 1985, at which time the supply of dental services will begin to catch up with the demand. After 1985, the projected rise in the demand for dental services will continue, but at a reduced rate so that, by 1990, the concurrent steady increase in the number of dentists will bring the supply of services into a non-inflationary balance with the demand under the projected alternative of dental prepayment coverage for 50 percent of the population. Under the other alternative projection, with 43 percent of the population covered by 1990, there will not be a shortage, but in fact a slight oversupply of dentists (Table V-22).

Year by year projections of the numbers of active dentists (civilian plus military) show a steady annual increase from 1976 through 1990. Table V-23 shows the projected number of active dentists at the end of each year, together with the annual net gain of new graduates over the attrition by death and retirement. The 1976 number of 115,200 active dentists is projected to increase to 126,240 by 1980, to 140,740 by 1985, and to 154,510 by the end of 1990—an increase of nearly 40,000, or 34 percent more than the number in 1976. Throughout the projection period, the net gain in the number of active dentists is accounted for by the entry of about 74,500 dental graduates to the active work force, offset by the loss of about 35,200 active dentists through death and retirement.

The expected supply of 154,510 active dentists in 1990, which is considered the most probable estimate, is based on the assumption that there will be only a slight increase from the 5,280 graduates in 1976 to 5,400 graduates in 1982, and that this level will be maintained through 1990.

A lower and a higher alternative estimate of the future supply of active dentists (civilian plus military) are presented in Table V-24. Under the low alternative projection, a supply of 152,610 active dentists in 1990 is estimated, based on the assumption that there will be little or no departure from the 1976 graduate figure of 5,280 in the subsequent years through 1990. A total of 159,030 active dentists in 1990, which is estimated under the high alternative projection, is based on the possibility that certain incentives in recent Federal legislation will induce dental schools to increase the annual number of graduates at a rate somewhat higher than in the expected projection. A level of 5,700 graduates would be reached in 1982 and that annual level would be maintained through 1990.

It can readily be seen that there are no great differences between the expected number of dental graduates and the alternative projections for a low and high output of dentists. This is in large part due to the fact that the present outlook for production of dentists in the 15 years ahead is for much greater stability than characterized the 1960's and early 1970's.

The projection of a large increase in the number of dentists in the years ahead results in steady and significant improvement in dentist-to-population ratios. The national ratio of 52 active civilian dentists per 100,000 civilian population in 1976 is projected to increase to 55 in 1980 and to 62 in 1990, based on the expected future supply of dentists.

Data and Analytical Needs

There is a serious need for comprehensive and reliable data on the number, distribution, professional characteristics, and professional activities of all types of dental manpower, on a national, State, and local basis, including counties and smaller areas.

Data on characteristics of dentists should include such basic information as age, types of activity, and extent of busyness. Also needed are data on the level of activity, e.g., full-time or part-time, and on the personnel "mix" of dental practices, e.g., number and types of auxiliaries per dentist. Data on these and other basic subjects are often omitted or inadequately covered in data gathering, despite their significance. One aspect of dental practice which has been particularly neglected in data acquisition is dentist productivity--an important factor in determining the amount of dental care available. Data on dentist productivity should be regularly collected as standard procedure in the future.

The future supply of dental manpower is obviously heavily dependent on dental educational institutions. Therefore, there is a need for the collection of many types of data about such institutions, their faculty, and their students. These data should include such elements as number, types, and background of faculty; number, sex, ethnic distribution, geographic origin, economic status, and career plans of students; and such data about the institutions as training facilities, nature of curricula, and costs of operation, including cost per student per year.

The data presently at hand on dental manpower and dental education are sometimes inconsistent, incomplete, or both. A much-improved mechanism for the gathering of such data is necessary for the dental community, health planning officials and, ultimately, the general public, to be well served.

Some data needs, including needs for dental data, will be met through the Cooperative Health Statistics System (CHSS) of the National Center for Health Statistics (NCHS). The CHSS is establishing a minimum data set on health-professions manpower through contracts with individual States. For Fiscal Year 1977, 18 participating States are expected to provide data relating to dentistry.

However, not only will this system require several more years for full implementation, it will also have to be modified in design and coverage to be responsive to the need for certain data on dental occupations and manpower. There is need to supplement these data with information from other sources.

Table V-1. Number of active dentists and dentist-to-population ratios: selected years, December 31, 1950-1976 1/

Year	Total active dentists	Active civilian dentists	Civilian population (thousands)	Active civilian dentists per 100,000 civilian population	Persons per active civilian dentist
1950........	79,190	75,310	151,238	49.8	2,008
1955........	84,370	78,270	164,597	47.6	2,103
1960........	90,120	84,500	179,780	47.0	2,127
1965........	95,990	89,640	192,951	46.5	2,149
1970........	102,220	95,680	203,109	47.1	2,123
1971........	103,350	97,210	205,496	47.3	2,115
1972........	105,400	98,860	207,306	47.7	2,097
1973........	107,280	100,780	208,951	48.2	2,073
1974........	109,430	103,030	210,555	48.9	2,044
1975........	112,[illegible]20	106,740	212,296	50.3	1,990
1976........	115,000	110,000	213,865	51.4	1,944

1/ Includes military dentists.

Sources: Health Resources Administration, Bureau of Health Manpower, Division of Dentistry, based on data from the American Dental Association, Bureau of Economic Research and Statistics.

U.S. Bureau of the Census. Current Population Reports P-25, Nos. 439 and 647.

Table V-2. Number of active dentists, by age group: December 31, 1976 1/

Age group	Active dentists	
	Number	Percent
All ages	115,000	100.0
Less than 35 years	36,610	31.8
Under 25 years	3,980	3.4
25-29 years	14,910	13.0
30-34 years	17,720	15.4
35-54 years	54,280	47.2
35-39 years	16,120	14.0
40-44 years	14,020	12.2
45-49 years	11,350	9.9
50-54 years	12,790	11.1
55 years and over	24,110	21.0
55-59 years	8,710	7.6
60-64 years	4,970	4.3
65-69 years	3,850	3,4
70-74 years	3,350	2.9
75 and over	3,230	2.8

1/ Includes military dentists.

Source: Health Resources Administration, Bureau of Health Manpower, Division of Dentistry.

Table V-3. Number of active civilian dentists and dentist-to-population ratios, by region, division, and State: December 31, 1976 (cont)

Geographic area	Active civilian dentists	Civilian population July 1, 1976 (thousands) 1/	Dentists per 100,000 civilian population	Persons per dentist
United States	110,000	212,976	52	1,936
Northeast	30,651	49,394	62	1,611
New England	7,451	12,179	61	1,635
Connecticut	1,978	3,104	64	1,570
Maine	455	1,059	43	2,327
Massachusetts	3,868	5,797	67	1,499
New Hampshire	428	818	52	1,911
Rhode Island	462	922	50	1,996
Vermont	260	476	55	1,831
Middle Atlantic	23,200	37,215	62	1,604
New Jersey	4,465	7,306	61	1,636
New York	12,642	18,057	70	1,428
Pennsylvania	6,093	11,852	51	1,945
North Central	27,946	57,574	49	2,060
East North Central	19,719	40,858	48	2,072
Illinois	5,716	11,191	51	1,958
Indiana	2,073	5,295	39	2,554
Michigan	4,578	9,090	50	1,984
Ohio	4,826	10,675	45	2,212
Wisconsin	2,526	4,607	55	1,824
West North Central	8,227	16,716	49	2,032
Iowa	1,293	2,869	45	2,219
Kansas	1,010	2,283	44	2,260
Minnesota	2,334	3,962	59	1,698
Missouri	2,160	4,750	45	2,199
Nebraska	853	1,541	55	1,807
North Dakota	279	631	44	2,262
South Dakota	298	680	44	2,282
South	27,796	67,995	41	2,446
South Atlantic	14,553	33,461	43	2,299
Delaware	256	576	44	2,250
District of Columbia	644	693	93	1,076
Florida	3,806	8,326	46	2,188
Georgia	1,894	4,912	39	2,593
Maryland	2,277	4,099	56	1,800
North Carolina	1,867	5,370	35	2,876
South Carolina	948	2,778	34	2,930
Virginia	2,238	4,887	46	2,184
West Virginia	623	4,820	34	2,921

Table V-3. Number of active civilian dentists and dentist-to-population ratios, by region, division, and State: December 31, 1976 (cont)

Geographic area	Active civilian dentists	Civilian population July 1, 1976 (thousands) 1/	Dentists per 100,000 civilian population	Persons per dentist
East South Central	5,039	13,555	37	2,690
Alabama	1,168	3,640	32	3,116
Kentucky	1,276	3,390	68	2,657
Mississippi	694	2,331	30	3,159
Tennessee	1,901	4,193	45	2,206
West South Central	8,204	20,979	39	2,557
Arkansas	668	2,099	32	3,142
Louisiana	1,449	3,845	38	2,633
Oklahoma	1,044	2,734	38	2,619
Texas	5,043	12,331	41	2,445
West	23,607	38,014	62	1,610
Mountain	5,142	9,711	53	1,889
Arizona	1,085	2,243	48	2,067
Colorado	1,488	2,535	59	1,704
Idaho	418	824	51	1,971
Montana	141	747	55	1,804
Nevada	307	600	21	1,954
New Mexico	481	1,152	42	2,395
Utah	771	1,223	63	1,586
Wyoming	178	386	46	2,169
Pacific	18,465	28,303	65	1,533
Alaska	184	357	52	1,940
California	13,743	21,234	65	1,545
Hawaii	530	831	64	1,568
Oregon	1,547	2,326	67	1,504
Washington	2,461	3,556	69	1,445

1/ State population figures do not add to totals and subtotals due to independent rounding.

Source: Health Resources Administration, Bureau of Health Manpower, Division of Dentistry, based on data from the American Dental Association, Bureau of Economic Research and Statistics.
U.S. Bureau of the Census. Current Population Report P-25, No. 642.

Table V-4. Geographic distribution of active civilian dentists, by sex: December 31, 1976

Geographic area	Both sexes	Male	Female	Percent female
United States	110,000	108,430	1,570	1.4
Northeast	30,651	30,168	483	1.6
New England	7,451	7,328	123	1.7
Connecticut	1,978	1,953	25	1.3
Maine	455	452	3	0.7
Massachusetts	3,868	3,780	86	2.2
New Hampshire	428	425	3	0.7
Rhode Island	462	460	2	0.4
Vermont	260	256	4	1.5
Middle Atlantic	23,200	22,840	360	1.6
New Jersey	4,465	4,402	63	1.4
New York	12,642	12,415	227	1.8
Pennsylvania	6,093	6,023	70	1.1
North Central	27,946	27,556	390	1.4
East North Central	19,719	19,399	320	1.6
Illinois	5,716	5,599	117	2.0
Indiana	2,073	2,039	34	1.6
Michigan	4,578	4,510	68	1.5
Ohio	4,826	4,763	63	1.3
Wisconsin	2,526	2,488	38	1.5
West North Central	8,227	8,157	70	0.9
Iowa	1,293	1,286	7	0.5
Kansas	1,010	1,006	4	0.4
Minnesota	2,334	2,309	25	1.1
Missouri	2,160	2,136	24	1.1
Nebraska	853	845	8	0.9
North Dakota	279	278	1	0.4
South Dakota	298	297	1	0.3
South	27,796	27,422	374	1.3
South Atlantic	14,553	14,331	222	1.5
Delaware	256	254	2	0.8
District of Columbia	644	603	41	6.4
Florida	3,806	3,758	48	1.3
Georgia	1,894	1,864	30	1.6
Maryland	2,277	2,234	43	1.9
North Carolina	1,867	1,845	22	1.2
South Carolina	948	939	9	0.9
Virginia	2,238	2,219	19	0.8
West Virginia	623	615	8	1.3

Table V-4. Geographic distribution of active civilian dentists, by sex: December 31, 1976 (cont)

Geographic area	Both sexes	Male	Female	Percent female
East South Central	5,039	4,972	67	1.3
Alabama	1,168	1,155	13	1.1
Kentucky	1,276	1,253	23	1.8
Mississippi	694	689	5	0.7
Tennessee	1,901	1,875	26	1.4
West South Central	8,204	8,119	85	1.0
Arkansas	668	661	7	1.0
Louisiana	1,449	1,431	18	1.2
Oklahoma	1,044	1,037	7	0.7
Texas	5,043	4,990	53	1.1
West	23,607	23,284	323	1.4
Mountain	5,142	5,108	34	0.7
Arizona	1,085	1,081	4	0.6
Colorado	1,488	1,476	12	0.8
Idaho	418	415	3	0.7
Montana	414	413	1	0.2
Nevada	307	302	5	1.6
New Mexico	481	478	3	0.6
Utah	771	769	2	0.3
Wyoming	178	174	4	2.2
Pacific	18,465	18,176	289	1.6
Alaska	184	183	1	0.5
California	13,743	13,190	253	1.8
Hawaii	530	523	7	1.3
Oregon	1,547	1,536	11	0.7
Washington	2,461	2,444	17	0.7

Source: Health Resources Administration, Bureau of Health Manpower, Division of Dentistry, based on data from the American Dental Association, Bureau of Economic Research and Statistics.

Table V-5. Number of active dental specialists, by specialty and by sex: December 31, 1976

Type of specialist	All dental specialists		Male		Female	
	Number	Percent distribution	Number	Percent distribution	Number	Percent distribution
All specialists......	10,828	100.0	10,725	100.0	103	100.0
Orthodontists................	4,479	41.4	4,434	41.3	45	43.6
Oral surgeons................	2,795	25.8	2,794	26.1	1	1.0
Pedodontists.................	1,208	11.2	1,173	10.9	35	33.9
Periodontists................	1,011	9.3	995	9.3	16	15.5
Endodontists.................	625	5.8	622	5.8	3	3.0
Prosthodontists..............	579	5.3	578	5.4	1	1.0
Public health dentists......	67	0.6	66	0.6	1	1.0
Oral pathologists...........	64	0.6	63	0.6	1	1.0

Source: American Dental Association, Bureau of Economic Research and Statistics. Distribution of Dentists in the United States by State, Region, District and County, 1976.

Table V-6. Number of active dental specialists and specialist-to-population ratios, by region, division, and State: December 31, 1976

Geographic area	Active dental specialists	Civilian population July 1, 1976 (thousands) 1/	Dental specialists per 100,000 civilian population
United States	10,828	212,976	5.1
Northeast	2,907	49,394	5.9
New England	730	12,179	6.0
Connecticut	205	3,106	6.6
Maine	29	1,059	2.7
Massachusetts	404	5,797	7.0
New Hampshire	24	818	2.9
Rhode Island	50	922	5.4
Vermont	18	476	3.8
Middle Atlantic	2,177	37,215	5.8
New Jersey	539	7,306	7.4
New York	1,172	18,057	6.5
Pennsylvania	466	11,852	3.9
North Central	2,516	57,574	4.4
East North Central	1,806	40,858	4.4
Illinois	571	11,191	5.1
Indiana	218	5,295	4.1
Michigan	526	9,090	5.8
Ohio	348	10,675	3.3
Wisconsin	143	4,607	3.1
West North Central	710	16,716	4.2
Iowa	125	2,869	4.4
Kansas	132	2,283	5.8
Minnesota	128	3,962	3.2
Missouri	246	4,750	5.2
Nebraska	55	1,541	3.6
North Dakota	11	631	1.7
South Dakota	13	680	1.9
South	2,797	67,995	4.1
South Atlantic	1,486	33,461	4.4
Delaware	28	576	4.9
District of Columbia	76	693	11.0
Florida	416	8,326	5.0
Georgia	176	4,912	3.6
Maryland	271	4,099	6.6
North Carolina	140	5,370	2.6
South Carolina	109	2,778	3.9
Virginia	207	4,887	4.2
West Virginia	63	1,820	3.5

Table V-6. Number of active dental specialists and specialist-to-population ratios, by region, division, and State: December 31, 1976 (cont)

Geographic area	Active dental specialists	Civilian population July 1, 1976 (thousands) 1/	Dental specialists per 100,000 civilian population
East South Central	528	13,555	3.9
Alabama	113	3,640	3.1
Kentucky	149	3,390	4.4
Mississippi	42	2,331	1.8
Tennessee	224	4,193	5.3
West South Central	783	20,979	3.7
Arkansas	76	2,099	3.6
Louisiana	119	3,815	3.1
Oklahoma	117	2,734	4.3
Texas	471	12,331	3.8
West	2,608	38,014	6.9
Mountain	445	9,711	4.6
Arizona	101	2,243	4.5
Colorado	164	2,535	6.5
Idaho	22	824	2.7
Montana	20	747	2.7
Nevada	33	600	5.5
New Mexico	49	1,152	4.3
Utah	49	1,223	4.0
Wyoming	7	386	1.8
Pacific	2,163	28,303	7.6
Alaska	15	357	4.2
California	1,664	21,234	7.8
Hawaii	48	831	5.8
Oregon	105	2,326	4.5
Washington	331	3,556	9.3

1/ State population figures do not add to totals and subtotals due to independent rounding.

Source: Health Resources Administration, Bureau of Health Manpower, Division of Dentistry, based on data from the American Dental Association, Bureau of Economic Research and Statistics.
U.S. Bureau of the Census. Current Population Reports P-25, No. 642

Table V-7. Number of active dentists, by primary type of dental employment: December 31, 1976

Primary type of dental employment	All dental specialists		Male		Female	
	Number	Percent distribution	Number	Percent distribution	Number	Percent distribution
Total	115,000	100.0	113,410	100.0	1,590	100.0
Practicing dentist (30 or more hours/week)	91,260	79.4	90,440	79.8	820	51.5
Practicing dentist (less than 30 hours/week)	10,080	8.8	9,690	8.5	390	24.5
On faculty or staff of dental school	3,230	2.8	3,080	2.7	150	9.4
Armed forces dentist	5,000	4.4	4,980	4.4	20	1.3
Public health dentist	1,160	1.0	1,090	1.0	70	4.4
Hospital staff dentist	1,420	1.2	1,390	1.2	30	1.9
Intern/resident/student	2,460	2.1	2,370	2.1	90	5.7
Staff member of health or dental organization	390	0.3	370	0.3	20	1.3

Source: Health Resources Administration, Bureau of Health Manpower, Division of Dentistry, based on data from the American Dental Association, Bureau of Economic Research and Statistics.

Table V-8. Percent of independent dentists who employ auxiliaries: selected years 1955-1975

Year	Type of auxiliaries		
	Dental hygienists	Dental assistants	All types 1/
1955.......	10.3	70.7	77.1
1958.......	14.0	75.5	81.8
1961.......	15.0	76.7	82.6
1964.......	20.2	82.4	89.9
1967.......	25.2	86.6	92.4
1970.......	30.8	85.6	89.9
1972.......	36.9	90.2	93.6
1975.......	41.3	92.5	96.1

1/ Includes dental laboratory technicians and secretary-receptionists, as well as dental hygienists and dental assistants. Any of these employees can be either full-time or part-time.

Source: American Dental Association, Bureau of Economic Research and statistics. The 1975 survey of Dental Practice. Also other survey reports of this series for prior years.

Table V-9. Average number of patient visits per week by dentists in general practice, with different numbers of auxiliaries, by age group of dentist: 1968 and 1969

Number of full-time or part-time auxiliaries per dentist	Average number of visits per week, by age of dentist							
	All ages	Under 40	40-44	45-49	50-54	55-59	60-64	65 and over
All dentists	67	69	77	75	69	60	51	39
Dentists with:								
No auxiliaries	45	49	56	54	51	47	39	29
1 auxiliary	60	59	68	68	64	61	53	43
2 auxiliaries	72	71	77	77	74	70	65	51
3 auxiliaries	83	82	88	86	89	79	71	64
4 or more auxiliaries	95	92	98	98	100	98	84	81

Source: Health Resources Administration, Bureau of Health Manpower, Division of Dentistry, based on data derived from the Second National Survey of Licensed Dentists, 1968 and 1969.

Table V-10. Average percent of time spent per week on various procedures by independent dents, by type of procedure: 1975

Type of procedure	Type of dentists		
	All independent dentists	General practitioners	Specialists
All procedures....	100.0	100.0	100.0
General procedures........	12.0	12.8	9.1
Palliative procedures....	3.4	3.9	1.4
Operative procedures.....	35.0	40.7	7.8
Prosthodontic procedures.	18.6	21.9	2.4
Endodontic procedures....	6.3	6.2	7.1
Periodontic procedures...	5.4	4.9	8.7
Orthodontic procedures...	10.9	3.6	40.4
Oral surgery procedures..	8.4	6.0	23.1

Source: American Dental Association, Bureau of Economic Research and statistics. The 1975 Survey of Dental Practice.

Table V-11. Number of dental schools, students, and graduates: selected academic years 1950-51 through 1976-77

Academic year	Number of schools	Number of students		Number of graduates
		Total	First-year	
1950-51	42	11,891	3,226	2,830
1955-56	43	12,730	3,445	3,038
1960-61	47	13,580	3,616	3,290
1961-62	47	13,513	3,605	3,207
1962-63	48	13,576	3,680	3,233
1963-64	48	13,691	3,770	3,213
1964-65	49	13,876	3,836	3,181
1965-66	49	14,020	3,806	3,198
1966-67	49	14,421	3,942	3,360
1967-68	50	14,955	4,200	3,457
1968-69	52	15,408	4,203	3,433
1969-70	53	16,008	4,355	3,749
1970-71	53	16,553	4,565	3,775
1971-72	52	17,305	4,745	3,961
1972-73	56	48,376	5,337	4,230
1973-74	58	19,369	5,445	4,515
1974-75	58	20,146	5,617	4,969
1975-76	59	20,767	5,763	5,336
1976-77	59	21,013	5,935	1/

1/ Data are not available at this time.

Source: American Dental Association, Council on Dental Education. Dental Students' Register for each selected academic year from 1950-51 through 1966-67. Annual Report on Dental Education for all subsequent academic years.

Table V-12. Minority students in first year of dental school: academic years 1971-72 through 1976-77 1/

Academic year	Total first year students	Racial/ethnic category							Percent minority of total first-year students
		Black	American Indian	Mexican-American	Puerto Rican	Oriental	Other minority	Total minority	
1971-72	4,705	245	4	27	13	112	11	412	8.8
1972-73	5,287	266	5	53	3	138	10	475	9.0
1973-74	5,389	273	12	64	5	141	34	529	9.8
1974-75	5,555	279	12	68	7	142	43	551	9.9
1975-76	5,697	298	22	64	11	186	56	637	11.2
1976-77	5,869	291	21	81	15	174	68	650	11.1

1/ Excludes University of Puerto Rico.

Source: American Dental Association, Council on Dental Education. Minority Student Enrollment and Opportunities in U.S. Dental Schools, for 1971-72 and for 1972-73. Minority Report: Supplement of Annual Report on Dental Education 1973-74, and for subsequent academic years.

Table V-13. Minority students in dental schools, by class year: academic year 1976-77 1/

Class year	Total students	Racial/ethnic category							Percent minority of total first-year students
		Black	American Indian	Mexican-American	Puerto Rican	Oriental	Other minority	Total minority	
All classes.......	20,790	955	64	263	33	611	173	2,099	10.1
First....................	5,869	291	21	81	15	174	68	650	11.1
Second....................	5,556	237	19	61	9	176	57	559	10.1
Third....................	4,187	220	14	67	5	129	29	464	11.1
Fourth....................	5,178	207	10	54	4	132	19	426	8.2

1/ Excludes University of Puerto Rico.

Source: American Dental Association, Council on Dental Education. _Minority Report: Supplement of Annual Report on Dental Education 1976-77_.

Table V-14. First-year students in dental schools, by sex: academic years 1970-71 through 1976-77

Academic year	All first-year students	Male students	Female students	Percent female of first-year students
1970-71..........	4,565	4,471	94	2.1
1971-72..........	4,745	4,598	147	3.1
1972-73..........	5,337	5,113	224	4.2
1973-74..........	5,445	5,054	391	7.2
1974-75..........	5,617	4,986	631	11.2
1975-76..........	5,763	5,056	707	12.3
1976-77..........	5,935	5,133	802	13.5

Source: American Dental Association, Council on Dental Education. Annual Report on Dental Education, 1976-77. Also prior annual issues.

Table V-15. Female students in dental schools, by class year: academic year 1976-77

	Total	1st year	2nd year	3rd year	4th year
Total students..	21,013	5,935	5,616	4,235	5,227
Female students........	2,349	802	664	488	395
Percent of total students.............	11.1	13.5	11.8	11.5	7.6
Percent of female students.............	100.0	34.1	28.3	20.8	16.8

Source: American Dental Association, Council on Dental Education. Annual Report on Dental Education, 1976-77.

Table V-16. Actual and projected numbers of students and graduates of dental schools, by 4-year and 3-year programs; academic years 1975-76 through 1989-90

Academic year	Number of schools	Number of students: Total	Number of students: First-year	Number of graduates
		All programs		
1975-76..........	59	20,767	5,763	5,336
1976-77..........	59	20,013	5,935	5,160
1977-78..........	59	20,970	5,860	5,110
1978799..........	60	21,290	5,900	5,310
1979-80..........	60	21,380	5,900	5,210
1980-81..........	60	21,630	5,900	5,380
1981-82/1989-90..	60	21,720	5,900	5,460
		Four-year programs		
1975-76..........	47	16,560	4,400	3,900
1976-77..........	49	46,850	4,590	3,730
1977-78..........	52	17,290	4,830	3,780
1978-79..........	54	18,050	4,920	4,070
1979-80..........	54	18,480	4,920	4,260
1980-81..........	54	18,770	4,920	4,470
1982-83/1989-90..	54	18,860	4,920	4,550
		Three-year programs		
1975-76..........	12	4,210	1,360	1,440
1976-77..........	10	4,160	1,340	1,430
1977-78..........	7	3,680	1,030	1,330
1978-79..........	6	3,240	980	1,240
1979-80..........	6	2,900	980	950
1980-81..........	6	2,860	980	910
1981-82/1989-90..	6	2,860	980	910

Source: Health Resources Administration, Bureau of Health Manpower, Division of dentistry.

Table V-17. Students and graduates in dental general practice residencies and dental specialty programs: 1976

Type of program	Number of students as of October 15, 1976		Number of graduates 1975-1976
	Total	First year	
All programs	3,508	1,904	1,930
General practice residencies	790	733	721
Dental schools	27	25	13
Non-dental school institutions	763	708	708
Specialty programs	2,718	1,171	1,209
Dental schools	1,982	893	892
Orthodontics	658	259	288
Oral surgery	323	104	102
Pedodontics	255	120	111
Periodontics	342	163	158
Endodontics	228	110	116
Prosthodontics	231	109	100
Dental public health	11	7	4
Oral pathology	45	21	13
Non-dental school institutions	736	278	317
Orthodontics	54	27	25
Oral surgery	356	112	120
Pedodontics	98	47	40
Periodontics	43	15	25
Endodontics	41	15	30
Prosthodontics	98	40	51
Dental public health	34	16	20
Oral pathology	12	6	6

Source: American Dental Association, Council on Dental Education. *Annual Report on Advanced Dental Education, 1976-77*.

Table V-18. Number of active civilian dentists per 100,000 population in metropolitan areas and non-metropolitan counties, by region, division, and State: 1974

Geographic area	All areas	Metropolitan areas by population: Total	1,000,000 or more	Under 1,000,000	Non-metropolitan counties by size of central city: Total	25,000 or more	10,000-24,999	5,000-9,999	Under 5,000
United States	50	56	42	48	34	43	36	32	26
Northeast	61	64	71	54	43	47	42	42	38
New England	59	62	73	56	45	45	41	52	44
Connecticut	60	62	--	62	32	25	38	--	--
Maine	42	54	--	54	37	40	34	35	41
Massachusetts	65	64	73	51	77	--	56	86	102
New Hampshire	49	57	--	57	46	50	10	50	53
Rhode Island	46	47	--	47	40	40	--	--	--
Vermont	51	--	--	--	51	64	54	42	41
Middle Atlantic	62	65	71	52	42	48	42	37	33
New Jersey	60	61	67	54	47	--	48	43	47
New York	66	69	74	52	41	50	36	34	33
Pennsylvania	57	61	67	51	41	44	44	37	28
North Central	46	51	55	45	37	44	38	37	31
East North Central	46	50	54	44	35	41	36	35	30
Illinois	50	54	56	42	33	38	38	32	25
Indiana	39	43	54	38	31	38	29	27	23
Michigan	48	50	49	50	39	57	44	34	36
Ohio	42	45	52	39	30	33	31	29	24
Wisconsin	52	58	62	53	45	52	43	49	36
West North Central	47	55	57	52	38	49	42	39	31
Iowa	44	47	--	47	42	63	38	39	33
Kansas	40	48	56	42	34	35	36	38	32
Minnesota	58	65	66	61	45	56	52	47	37
Missouri	43	50	51	45	30	44	32	29	26
Nebraska	54	64	--	64	46	52	50	52	40
North Dakota	36	50	--	50	34	41	45	38	25
South Dakota	38	45	--	45	36	50	49	45	27
South	38	46	51	43	25	36	28	24	19
South Atlantic	39	47	52	43	25	34	29	23	18
Delaware	40	46	--	46	26	--	26	--	--
District of Columbia	69	69	69	--	--	--	--	--	--
Florida	43	46	47	46	29	29	35	22	24
Georgia	28	37	42	29	17	27	23	16	10
Maryland	53	56	56	24	38	40	42	36	31
North Carolina	32	41	--	41	24	24	27	26	16
South Carolina	20	38	--	38	21	30	20	19	18
Virginia	44	51	56	49	30	46	37	29	22
West Virginia	33	40	--	40	29	71	34	26	18

Table V-18. Number of active civilian dentists per 100,000 population in metropolitan areas and non-metropolitan counties, by region, division, and State: 1974 (cont)

Geographic area	All areas	Metropolitan areas by population			Non-metropolitan counties by size of central city				
		Total	1,000,000 or more	Under 1,000,000	Total	25,000 or more	10,000-24,999	5,000-9,999	Under 5,000
East South Central	35	46	32	47	25	37	28	22	18
Alabama	31	38	--	38	21	32	21	17	15
Kentucky	37	52	32	56	24	39	30	26	19
Mississippi	27	36	--	36	24	35	29	19	17
Tennessee	42	52	--	52	29	46	32	26	22
West South Central	38	44	50	40	27	41	28	25	21
Arkansas	32	43	--	43	25	39	24	24	21
Louisiana	37	46	51	41	23	32	27	18	18
Oklahoma	38	44	--	44	31	46	30	29	21
Texas	40	44	50	38	27	42	28	27	23
West	60	65	67	58	45	48	49	41	39
Mountain	50	57	64	55	40	46	43	36	36
Arizona	43	49	--	49	27	36	24	26	19
Colorado	57	61	64	52	48	50	51	39	50
Idaho	49	72	--	72	45	67	47	30	34
Montana	48	57	--	57	46	73	58	45	30
Nevada	48	51	--	51	35	--	56	38	27
New Mexico	34	49	--	49	27	33	25	24	17
Utah	65	68	--	68	54	--	70	65	39
Wyoming	48	--	--	--	48	46	57	45	45
Pacific	64	66	68	60	51	50	53	49	46
Alaska	42	--	--	--	--	--	--	--	--
California	63	64	65	61	53	47	54	55	56
Hawaii	59	61	--	61	50	50	--	--	--
Oregon	67	78	85	62	51	58	53	40	44
Washington	67	74	84	59	48	49	51	51	36

Source: Health Resources Administration, Bureau of Health Manpower, Division of Dentistry, based on the 1974 Register of Licensed Dental Manpower.

Table V-19. Distribution of counties according to ratio of persons per active civilian dentist, by State: 1974

State	Number of counties by persons-per-dentist ratio						
	Without any dentist	5,000 and over	4,000-4,999	3,000-3,999	2,000-2,999	Under 2,000	All counties
United States	234	579	330	554	842	537	3,076
Alabama	--	33	9	12	11	2	67
Alaska	--	--	--	--	1	--	1
Arizona	1	1	2	4	2	4	14
Arkansas	3	19	18	17	15	3	75
California	1	--	--	4	14	39	58
Colorado	12	1	1	4	19	26	63
Connecticut	--	--	--	1	2	5	8
Delaware	--	--	--	2	--	1	3
District of Columbia	--	--	--	--	--	1	1
Florida	5	12	12	11	20	7	67
Georgia	43	64	23	16	9	4	159
Hawaii	--	--	--	--	--	4	4
Idaho	3	2	3	8	17	11	44
Illinois	3	15	11	25	42	6	102
Indiana	2	9	13	30	34	4	92
Iowa	--	11	7	26	38	17	99
Kansas	9	6	7	28	43	12	105
Kentucky	6	33	24	36	14	7	120
Louisiana	4	32	9	7	11	1	64
Maine	--	--	2	3	6	5	16
Maryland	--	2	5	4	7	6	24
Massachusetts	--	--	--	--	2	12	14
Michigan	2	4	11	12	32	22	83
Minnesota	--	4	5	11	37	30	87
Mississippi	4	38	12	16	10	2	82
Missouri	5	30	12	25	29	14	115
Montana	11	6	4	6	14	15	56
Nebraska	13	8	4	7	28	33	93
Nevada	7	--	1	1	5	3	17
New Hampshire	--	--	--	--	4	6	10
New Jersey	--	--	--	1	6	14	21
New Mexico	6	9	2	7	5	3	32
New York	--	2	3	10	25	22	62
North Carolina	5	38	13	18	21	5	100
North Dakota	8	12	3	9	14	7	53
Ohio	--	15	9	22	34	8	88
Oklahoma	4	19	13	19	15	7	77
Oregon	2	1	1	2	9	21	36

Table V-19. Distribution of counties according to ratio of persons per active civilian dentist, by State: 1974 (cont)

State	Number of counties by persons-per-dentist ratio						
	Without any dentist	5,000 and over	4,000-4,999	3,000-3,999	2,000-2,999	Under 2,000	All counties
Pennsylvania	--	2	2	7	36	20	67
Rhode Island	--	--	--	--	3	2	5
South Carolina	--	22	9	11	2	2	46
South Dakota	17	8	3	8	20	11	67
Tennessee	4	21	19	21	22	8	95
Texas	35	51	30	59	59	20	254
Utah	4	1	--	3	7	14	29
Vermont	1	1	--	1	5	6	14
Virginia	9	19	14	17	28	11	98
Washington	1	2	--	3	17	16	39
West Virginia	2	21	9	6	13	4	55
Wisconsin	1	4	4	10	29	24	72
Wyoming	1	1	1	4	6	10	23

Source: Health Resources Administration, Bureau of Health Manpower, Division of Dentistry, based on the 1974 Register of Licensed Dental Manpower.

Table V-20. Percent distribution of independent dentists by average waiting time for initial appointment, by size of city: 1975

City size	Total	1-2 days	3 days-1 week	1-2 weeks	2 weeks-1 month	1 month or more
All independent dentists...	100.0	15.7	27.7	30.0	18.1	8.5
Under 2,500........................	100.0	9.7	23.9	23.1	23.1	20.2
2,500-24,999.......................	100.0	11.2	24.7	27.9	21.0	15.2
25,000-99,999......................	100.0	16.5	26.9	31.4	18.7	6.5
100,000-999,999....................	100.0	17.7	27.6	33.3	16.3	5.1
Over 1,000,000.....................	100.0	21.1	38.0	25.1	12.7	3.1

Source: American Dental Association, Bureau of Economic Research and Statistics. *The 1975 Survey of Dental Practice*.

Table V-21. Percent distribution of independent dentists according to practice business, by size of city: 1975

City size	Total	Too busy	Over-worked	Enough patients	Not busy enough
All independent dentists............	100.0	14.0	17.6	46.1	22.3
Under 2,500...............................	100.0	25.0	22.7	39.4	12.9
2,500-24,999.............................	100.0	21.0	20.3	40.8	17.9
25,000-99,999............................	100.0	12.0	16.4	48.6	23.0
100,000-999,999..........................	100.0	10.2	16.0	48.7	25.1
Over 1,000,000...........................	100.0	8.7	15.4	48.9	27.0

Source: American Dental Association, Bureau of Economic Research and Statistics. *The 1975 Survey of Dental Practice*.

Table V-22. Total dentist requirements, using alternative proportions of population covered by dental prepayment: estimated 1975; projected 1980, 1985, and 1990 1/

Year	Total supply of dentists	Alternative I Prepayment (percent of total population)	Alternative I Total number of dentists required	Alternative II Prepayment (percent of total population)	Alternative II Total number of dentists required
1975..................	127,400	15.5	131,900	15.5	131,900
1980..................	142,100	26.9	148,300	26.9	148,300
1985..................	157,400	36.7	160,900	40.0	162,700
1990..................	172,300	43.3	170,200	50.0	172,200

1/ Total dentists includes all living dentists, active and retired.

Source: Health Resources Administration, Bureau of Health Manpower, Division of Dentistry, *Projections of National Requirements for Dentists: 1980, 1985, and 1990*. DHEW Publication No. (HRA) 77-48 (in press, 1977).

Table V-23. Annual additions and losses to the supply of active dentists: actual 1976, and projected 1977 through 1990 1/

Year	Number active January 1	Changes in supply January 1-December 31 Graduate additions	 Losses from deaths and retirements	 Net gains	Number active December 31
1976.....................	112,020	5,280	2,100	3,180	115,200
1977.....................	115,200	5,110	2,380	2,730	117,930
1978.....................	117,930	5,060	2,370	2,690	120,620
1979.....................	120,620	5,250	2,370	2,880	123,500
1980.....................	123,500	5,150	2,410	2,740	126,240
1981.....................	126,240	5,320	2,430	2,890	129,130
1982.....................	129,130	5,400	2,450	2,950	132,080
1983.....................	132,080	5,400	2,480	2,920	135,000
1984.....................	135,000	5,400	2,520	2,880	137,880
1985.....................	137,880	5,400	2,540	2,860	140,740
1986.....................	140,740	5,400	2,570	2,830	143,570
1987.....................	143,570	5,400	2,620	2,780	146,350
1988.....................	146,350	5,400	2,630	2,770	149,120
1990.....................	151,840	5,400	2,730	2,670	154,510

1/ Includes military dentists; excludes dentists in Puerto Rico and graduates of the University of Puerto Rico.

Source: Health Resources Administration, Bureau of Health Manpower, Division of Dentistry.

Table V-24. Alternative projections of the supply of active dentists: 1980, 1985, and 1990 1/

Year	Projected supply of active dentists		
	Expected	Low alternative	High alternative
1976 (actual)...........	115,200	115,200	115,200
1980....................	126,240	126,060	127,030
1985....................	140,740	139,730	143,430
1990....................	154,510	152,610	159,030

1/ Includes military dentists; excludes dentists in Puerto Rico and graduates of the University of Puerto Rico.

Source: Health Resources Administration, Bureau of Health Manpower, Division of Dentistry.

VI. OPTOMETRY

Optometrists represent only a small proportion of all health practitioners, but they play a significant role in providing health services, mainly as the point of entry to the health care system for the provision of vision care services. Optometrists examine eyes for vision defects and other abnormal conditions, test depth and color perception, and when necessary prescribe lenses and treatment. As providers of primary health care, optometrists may refer patients for treatment of ocular and systemic diseases to ophthalmologists. Conversely, some of the vision services usually provided by optometrists may also be rendered by ophthalmologists.

From all indications, there appears to be a shortage of optometrists and other vision care practitioners in the United States. The number of optometrists has grown only slightly in recent years, and less growth is anticipated than in other health professions. Since a large number of optometrists graduated through the G.I. Bill and will likely be retiring in the next 10 to 15 years, the expected net addition of new practitioners in the field will have a somewhat smaller impact on total supply than in other health disciplines. However, by 1990 supply and requirements should be more or less in balance.

A number of issues and trends relate directly to the optometrist's role in the health care system and the provision of vision care services. A factor likely to affect the practice of optometry and provision of services is the increase in continuing education requirements as a pre-requisite to licensure renewal. Optometrists are increasingly being included in various health care programs, which should affect the overall provision of vision care and the requirements for their services. In organized health delivery settings more attention is being paid to quality assessment of vision care. Judgments about quality of care and practitioner proficiency are normally difficult, but optometry normally deals with readily visualized or measurable conditions and is more amenable to the comparision of practice to standards than are most health professions. Peer review may be used to measure and assure the quality of medical and optometric practice, but the role of optometrists in the review responsibilities of Professional Standards Review Organization has yet to be determined. Among other changes that will affect the profession is the increasingly widespread use of auxiliaries which will have an impact on provision of services and on the requirements for practitioners. New technological developments may also change the scope of practice.

A major issue that has surrounded optometry for many years, of course, is the relationship between optometry and ophthalmology. While some overlap in services, specifically refractive services, exists at present, there are specific unique roles in the provision of vision care for both professions. Future interactions between the professions will impact on the provision of vision care services, on requirements for these services, and on training and education for both professions. These and other issues are important and developments must be monitored in order to evaluate the role of optometrists in the provision of vision care services.

Number and Characteristics of Optometrists

The number of active optometrists has increased only slightly in recent years, despite the impetus provided by recent Federal legislation. The number of new optometrists has only slightly exceeded the number of optometrists leaving the profession. In 1975, it is estimated that there were 19,900 active optometrists (civilian and military). Of these, approximately 19,200 were providing some form of patient care.

On the basis of limited historical data, the number of active civilian optometrists has increased only moderately in recent years, and has not kept up with population growth. Such increases in supply as have occurred are due to the rise in graduates from schools supported under the Health Professions Educational Assistance Act of 1963.

In view of the overall increase in the number of active civilian optometrists, the ratio of active optometrists to population has declined slightly, from 9.3 active civilian optometrists per 100,000 population in 1968 to 9.2 per 100,000 in 1973.

The effects of the G.I. Bill of the 1950's and the sudden increase in numbers of optometrists completing their education can still be seen today. One half of all optometrists are between 45 and 60 years of age. (Table A-VI-I) On the other hand, recent increases in supply are becoming increasingly evident, as nearly 20 percent of active optometrists are under age 35, and optometry is expected to become an increasingly younger group.

Relatively few women are in optometry, with the proportion of active female optometrists only slightly more than 2 percent. However, the population of females in schools of optometry now exceeds 10 percent, and the proportion of women is expected to rise somewhat in the coming years.

Overall numbers of minorities in optometry are also quite small, although the field appears to be unusually attractive for those of Japanese/Chinese descent (Table A-VI-2). Although only 480 active optometrists (2.5 percent of the total) in 1973 were members of racial/ethnic minority groups, fully three-fifths of this total were Japanese/Chinese. Intensive recruiting efforts have served recently to increase the number and proportion of minorities in the field.

Few optometrists work exclusively in activities other than patient care, and relatively few optometrists work part-time. If full-time is defined as working 30 or more hours a week, more than nine out of ten active optometrists worked on a full-time basis. Among the active optometrists, only a small proportion (3.5 percent) were engaged exclusively in non-patient care activities, generally consisting of teaching, research or administration.

Optometrists are usually self-employed. In 1973, the number and percent who were self-employed (Table A-VI-3), mostly in solo practice, was nearly 14,900 or 77 percent of all active optometrists. As with podiatrists and other health professionals, however, there is movement in optometry away from solo practice and toward partnerships or groups. (Table A-VI-4) In 1973, employed optometrists accounted for 3,600 or nearly 20 percent of active optometrists. Because of the costs of setting up a solo practice and the rapidly expanding nature of optometric practice, optometry graduates appear to be increasingly favoring associateship or partnership arrangements from among the available career alternatives.

Newly graduated optometrists also exhibit a far greater tendency than other optometrists to be employed rather than self-employed (Table VI-2). Although nearly 20 percent of all active optometrists were employed, this proportion varied from 50 percent of those under 30 years of age, to only 13 percent of those 50-59 years of age. Also, while less than 3 of 5 self-employed optometrists under 30 years of age were in solo practice, more than 4 of 5 self-employed optometrists over 40 were in this form of practice. A comparison of 1968 and 1973 data for principal form of employment shows a decline in the proportion who were self-employed and a corresponding increase in the proportion employed. While military service accounts for a large percent of those employed, a large number were employed by optometrists and other employers. This trend toward multiple practitioner arrangements and salaried employment may have implications for the characteristics of optometric clinical practice such as productivity, number and types of services offered by the practitioner, and even the geographic distribution of optometrists.

Developments in Licensure of Optometrists

The regulation of the practice of optometry has undergone a number of significant changes since 1973. The most pervasive has been the increase in continuing education requirements. Optometry appears to have one of the most major and significant continuing education programs of all the health professions. Beginning with Iowa in 1938, forty-two States have adopted some form of continuing education as a requirement to license renewal, although the nature of the requirements imposed by States vary considerably. Most States specify that credit may be given for optometric or other scientific education, lectures, symposiums, courses approved by the board for post-graduate study at a school of optometry, and courses given by the American

Optometric Association. Such programs are offered by over 100 organizations, making it easier for optometrists to update their credentials.

Geographic Distribution of Optometrists

On the basis of most measures of determining geographic unevenness of distribution of health manpower, it is generally recognized that optometrists are more evenly distributed than most other health professions. However, there continues to be disparity in the provision of optometric services to various areas of the country. This reflects the fact that the distribution of optometrists on a geographic basis needs to be linked directly to consideration of the distribution of ophthalmologists, many of whom provide some similar services. Although the distribution of optometrists is somewhat uneven, the distribution of ophthalmologists does little to alleviate the situation. A substantial proportion of the population in the United States has little or no access to the services of ophthalmologists.

Among the four geographic regions, the ratio of active optometrists to resident population varied from 6.9 per 100,000 in the South to 10.9 per 100,000 in the West, a difference of nearly 60 percent, (Table A-VI-5). Among the States, Illinois had the highest ratio, 14 per 100,000, while the lowest State, Alabama, had a ratio (5 per 100,000) only about one-third that of Illinois.

Although the same two States, California and New York, have the largest numbers of both ophthalmologists and optometrists in the Nation, there is no apparent correlation between the relative numbers of ophthalmologists and optometrists at least as related to population. On a regional basis, for both ophthalmologists and optometrists the Pacific States have the highest ratios of practitioners to population, while the lowest ratios for both disciplines occur in the East South Central States.

Nationally, there are 2 optometrists to 1 ophthalmologist and this ratio is approximated or exceeded in most States. However, notable exceptions exist. Only in Maryland and the District of Columbia, which also rank very high in relative numbers of all physicians, does the number of active ophthalmologists exceed the number of active optometrists. Although seven States--Maine, Rhode Island, Indiana, Illinois, North Dakota, South Dakota, and Nebraska--had more than three times as many optometrists as ophthalmologists, a number of other States had less than three optometrists for each two ophthalmologists. Thus, while some states are able to provide added vision services through ophthalmologists, others cannot. In addition, the services of ophthalmologists are rendered primarily in large metropolitan areas, while the ratio of optometrists to population is about the same (9 per 100,000) in metropolitan as in non-metropolitan counties. Nevertheless, optometrists provide a greater proportion of total vision care in non-metropolitan and rural areas.

Although the ratio of optometrists to population is somewhat greater in counties in SMSA's over 1 million population than in counties in SMSA's of smaller size, their distribution still remains better than that of most health professionals. It is only in non-metropolitan counties that substantially lower than average ratios of optometrists to population exist. The percent of optometrists practicing in metropolitan areas is somewhat higher than the percent of the resident population, whereas the percent of ophthalmologists practicing in these areas substantially exceeds the percent of the resident population. In non-metropolitan areas this pattern is reversed, with the percent of persons residing in those areas being more than 2 1/2 times the percent of opthalmologists, and somewhat larger than the percent of optometrists.

An examination of persons-per-optometrist ratios for counties, often used to show geographic distribution, indicates large variation exists between the ratios. As a matter of fact, there are 840 counties (more than one fourth of all counties) that have no optometrists at all, and 552 counties (18 percent) that have a ratio of 15,000 or more residents per optometrist, far above the ratio recommended by the American Optometric Association of approximately 7,000 residents per optometrist, or 14.5 optometrists per 100,000 population.

Optometric Education

In the recent past, enrollments and subsequent graduates in schools of optometry peaked in the early 1950's, reaching their highest level until the early 1970's. (Table VI-1) In academic year 1951-2, the 10 schools of optometry enrolled 2,435 students and graduated 961 students. At that time, only 3 years of optometric school curriculum were required. During the decade of the 1950's, enrollments declined sharply, reaching the level of 1,101 students and 316 graduates in academic year 1960-61. Coincidental with the enactment and implementation of the Health Professional Educational Assistance Act of 1963, enrollment and graduates began to rise sharply. Total enrollment increased from 1,547 students in academic year 1964-65 to 3,909 students in academic year 1975-76, an increase of more than 150 percent. First-year enrollments during the same period rose more than 80 percent, from 593 to 1,078, (the larger increase in total enrollment was due to the increase in the number of years of professional education). The number of graduates rose by 140 percent, from 377 to 905 during the same period. Part of the increase in the number of graduates reflects the increase from 10 to 13 in the number of schools of optometry during this time.

In academic year 1976-77, the Nation's optometrists were being trained in 13 accredited schools and colleges of optometry. Regionally, the schools of optometry are relatively evenly distributed, although the Northeast, South, and West had three schools each, while the North Central States had four.

All of the 13 optometry schools have a 6-year curriculum which includes a minimum of 2 years of pre-optometry education at an accredited college plus 4 years of professional training at a school of optometry leading to a Doctor of Optometry degree (O.D.). In 1976, the 12 schools with 4 years of classes enrolled 1,078 first-year students and graduated 905 students. Nearly one-half of these students graduated from three schools: the Illinois, Pennsylvania and Southern Colleges of Optometry. The Pennsylvania College of Optometry produced the most graduates, 144; of the established schools, the Ohio State University College of Optometry graduated the fewest students, 52.

First-year enrollment in the 13 schools of Optometry totalled 1,078 students in academic year 1975-76 (Table VI-2). The Southern and Illinois Colleges of Optometry had the largest first-year enrollments, 152 and 151 students respectively.

In 1976, 72 or nearly 9 percent of the graduates were women. This number is expected to rise substantially in the upcoming years as more than 14 percent of the entering class in 1975-76 were female.

The location of the school of optometry is a prime factor in determining where the optometrist actually practices after graduation. More than four out of five optometrists under age 45 practice in States with schools of optometry, and are graduates from the school(s) within the State. The proportion of all active optometrists who graduated from schools within their State of practice is more than 92 percent in Illinois, 86 percent in Pennsylvania, 81 percent in California and 77 percent in Massachusetts (Tables A-VI-5 and A-VI-7).

Data from the 1973 inventory of optometrists show that schools of optometry make a varied contribution of optometrists to non-metropolitan areas. More than 2 of 5 graduates of two schools, the Southern College of Optometry and the Pacific University College of Optometry, practice in non-metropolitan areas. Three other schools have contributed nearly one-third of their graduates to these areas--Illinois, Houston, and Indiana. Together, these schools account for three out of four optometrists practicing in non-metropolitan areas. One school, the Illinois College of Optometry and its predecessors in Illinois, graduated approximately one-third of all active optometrists in the United States (Table A-VI-8).

Trends in Optometry Education

Optometry is one of several health professions that serves the public as a means of entry into the health care system. As such, the forces for change in the optometric curriculum are similar to those confronting the other health disciplines. Most notable among these forces is the rapid expansion of knowledge of the eyes, the expanding scope of optometric practice, increased social awareness of the importance of proper eye care, student demands for improved curricular relevance, and the priorities of external funding sources. Since many disease entities have observable manifestations in the eye, the optometry curriculum is being broadened to improve the continuity of vision care for the patient, serving as a bridge between the medical and optometric professions. This is resulting in a trend toward primary vision health care in optometric practice.

The changes that are occurring in optometric education fall into two basic categories: content of curricula and location of training. Curricula content is being changed in many ways, including revisions to accommodate the addition of new knowledge and new areas of emphasis. Courses in human nutrition and in the behavioral and sociological aspects of health and disease are new areas of content and areas of increased emphasis, and added emphasis is being placed on the areas of low vision training, rehabilitative procedures, pediatric and geriatric optometry, as well as on training in community, environmental and public health. The most common areas of change are in training of students to detect pathological departure from the health of the eye, as well as the use of diagnostic drugs. The latter has necessitated increased curricular emphasis on general and ocular pharmacology. Congress recognized the need for change by a provision in PL 94-484 for grants and contracts for curriculum development in schools of optometry.

Other curricular trends are: earlier student contact with patients to improve the student's perception of the relevance of the basic sciences to clinical practice; elimination or modification of the "lock-step" curriculum to permit the student to progress more at his own pace; the greater use of modern educational technology such as the use of television and computer-assisted instruction; and the increased offering of electives to permit the student to pursue knowledge in areas of special interest. Remedial programs are also being offered with the objective of retaining students in academic difficulty in schools and reducing attrition rate in schools. As indicated earlier, continuing education has become a major activity of many schools, since a large majority of the States now require a demonstration of competency in order to obtain re-licensure for optometric practice.

Major changes have been made recently in the specific setting or location of training. Numerous instances exist where the student is receiving part of his instruction in external clinical settings such as preceptor offices, health maintenance organizations, community clinics and special optometric clinics established in underserved areas. These off-campus training sites have greatly facilitated the teaching of the utilization of optometric auxiliaries, demonstrated new services, provided health services, exposed students to rural and inner city practice possibilities and developed interdisciplinary learning opportunities.

Optometrists and Delivery of Care

The role of the optometrist as a provider of primary care has increased steadily in importance in recent years. The optometrist also has assumed a larger role in military settings, as well as in institutional care as typified by the presence of optometrists in Health Maintenance Organizations. In this setting, the optometrist may evaluate all patients who report any visual problems. In a number of States, optometry State laws have been redefined to reflect the recognition of optometrists as primary vision care providers. In these states, optometrists may ascertain the presence of disease or pathological conditions and refer the patient to the appropriate medical practitioner for further diagnosis and treatment.

In terms of the need for vision care services, both met and unmet, about half of the population who require some form of vision care services actually receive them. About nine out of ten of the patients who need vision care services require services which are within the present scope of optometry. Only about 10 percent of the population with vision care problems require medical treatment or surgery which must be provided by ophthalmologists, as shown by the 1968 NCHS Survey of Ophthalmologists.

In terms of actual services currently being provided, about two-thirds of the population, or 33 million people receiving vision or eye care receive such care from optometrists. About one-third or 17 million of the population seek and receive vision or eye care from ophthalmologists. As reports show, a substantial area of overlap of services exists in the provision of refractive services, and at least some proportion of the population that receives ophthalmological care could go to optometrists for this care.

The number of optometrists is increasing, and so is the number of patients each can see, (i.e. productivity). A major factor in this increased productivity on the part of optometrists is their rising use of auxiliaries. While only about one-third of active optometrists in 1973 utilized full-time auxiliaries, there appears to be a far greater tendency on the part of younger, newly graduated optometrists to utilize auxiliaries than optometrists in practice for a number of years. In part, this may reflect the training in optometry schools that emphasize utilization of auxiliary services in optometric practice. While data on specific services provided by chairside optometric auxiliaries does not exist, data from a 1973 survey suggest considerably greater productivity on the part of optometrists utilizing auxiliaries than optometrists without such services.

On the average, optometrists working in patient care activities on a full-time basis perform approximately 1,350 vision analyses (basic measure of productivity) a year, or about one vision analysis per hour for an optometrist working approximately 30 hours per week. Those optometrists utilizing full-time auxiliaries perform approximately

1,600 vision analyses annually, or nearly 20 percent more than the average of all active optometrists.

Optometrists in smaller metropolitan areas also appear to have far greater productivity (in terms of number of vision analyses) than do optometrists in larger metropolitan areas. This may be related to the availability of ophthalmological services in the larger metropolitan areas, in that some patients may utilize the services of an ophthalmologist instead of an optometrist. In non-metropolitan areas, on the other hand, the reverse pattern in productivity seems to be true. Optometrists in larger counties perform more vision analyses, on the average, than do their counterparts in smaller counties.

The Future Supply of Optometrists

The supply of optometrists is expected to rise sharply in the coming years. Several projections of the supply of active optometrists to 1990 are presented here under different assumptions as to graduate input over the projection period. 1/ The projection findings under each set of these different assumptions are described below and are summarized in Tables VI-3 and VI-4.

The basic determinant of the future supply of optometrists is very clearly the current and anticipated enrollment in optometry schools. As indicated earlier, optometry enrollments have grown rapidly since the early 1960's, with new Federal legislation providing much of the impetus for the recent increases. In terms of the projected supply of optometrists, the most realistic assumption is that schools will meet the capitation requirements set down by P.L. 94-484, that of increasing full-time first-year enrollments in the 1978-79 academic year in each school by 5 percent or 5 students over the 1976-77 enrollment, depending on the size of the 1976-77 first year class. No additional growth or enrollment per existing school or college is anticipated, although the basic projection series also assumes that one new school of optometry will open during the projection period--most likely a Southern regional school. The basic projection of the graduating classes of 1973-74 through 1989-90 then results in a total gross graduate input of 16,757 for that period. On this basis, the supply of active optometrists is expected to increase from 19,900 in 1975 to 22,000 in 1980 and to 26,700 in 1990. Thus, the number of active optometrists is expected to increase by about one-third between 1975 and 1990, or about 2 percent a year, slightly faster than the growth between 1970 and 1975. The ratio of active optometrists to population is projected to increase somewhat by 1990, reaching 10.9 per 100,000 population, as compared with 9.3 per 100,000 population in 1975. For the purposes of this report, the basic assumption is believed to provide the most realistic supply estimates.

1/ See Appendix (A-VI-8) for description of Methodology.

By way of contrast, if full-time first year enrollments should rise substantially beyond those mandated by the legislation and assumed in the basic projection series, the increases in active optometrists would be even larger. For this "high" projection series, an annual increase of 1 percent per year in enrollment per existing school above and beyond increases described in the basic series was used, and again it was assumed that only one new school would open in academic year 1981-82. In this estimate, the number of optometrists would be slightly higher than the basic estimate, or 27,100 by 1990, a ratio of 11.1 optometrists per 100,000 population.

On the other hand, if schools meet the requirements of P.L. 94-484 by providing for the specified proportion of full-time students to be comprised of residents of States in which there are no accredited schools of optometry and if no new schools of optometry open, then first-year enrollments would then be maintained at about the 1976-77 levels. Under this "low" estimate, the supply of optometrists would reach 26,100 by 1990, for a population ratio of 10.6 optometrists per 100,000 population.

Although the distribution of future graduates can not be projected with any degree of precision, current estimates are based upon the assumption that there will be little improvement in the geographic distribution of optometrists. The proportion of recent graduates from schools of optometry practicing in non-metropolitan areas is about the same or slightly lower for nine out of ten established optometry schools as compared to the proportion of total graduates practicing in these areas.

Requirements for Optometrists

Although it is difficult to determine the exact level of requirements for optometrists, it is likely that the projected supply of optometrists will be roughly in balance with the number of optometrists required.

There are several ways to measure requirements. One measure is the optimum ratio of 14.3 optometrists per 100,000 population utilized by the American Optometric Association. Such a ratio if applied to projected 1990 population would indicate a requirement for about 35,000 optometrists in that year, well above the anticipated supply. Another measure of requirements for optometrists might be to apply the best State ratio in 1975 as a standard to be met by all States. Such a standard would show a requirement for about 34,000 optometrists in 1990, again well above the anticipated supply of 26,700 active optometrists.
Thus, if these "need" related standards are applied, there would appear to b shortage of 7,000-8,000 optometrists projected for 1990.

On the other hand, the Supply Output and Requirements Model (SOAR) generates an increase in requirements for optometrists of nearly one-third in 1990 over current levels. These requirements for optometrists take into account recent trends in per capita utilization of optometric services, and are based on increased utilization of optometric services by the population during 1975 to 1990. Such levels of projected requirements for optometrists are about equal to the projected supply of optometrists in 1990. All things considered, the best judgement is that supply and requirements will be in balance by 1990.

Data and Analytical Needs

As indicated previously, 1973 data from the Optometric Manpower Resources Project supported by the Bureau of Health Manpower are the latest available data on optometrists.

However, more current data on optometrists are currently being collected in States participating in the Cooperative Health Statistics System, and also by means of the Bureau of Health Manpower Inventory. But data and standards are needed in the designation of health manpower shortage areas, and for health manpower analysis of data from small geographic areas. It would also be desirable to have another data point for trend analysis of optometric data. The only reliable data on optometrists are from the NCHS 1968 and 1973 surveys.

Optometrist Projection Methodology

Estimates of the number of active optometrists for 1975-90 were calculated utilizing the data from the 1973 Bureau of Health Manpower/American Optometric Association survey of optometrists as a base. It was assumed that the base reflected a point in time of December 31, 1973. Data on graduates of optometry for 1974 through 1976 were obtained from school reports on FY 76 Capitation Grant applications; the American Optometric Association provided estimates of first-year enrollments through 1975-76. Graduate projections to 1990 were computed from the number of first-year students reported 4 years earlier utilizing an attrition rate of 12 percent in both the basic methodology and the alternative supply projections in line with the most recent experience. Thus, 88 percent of entering optometry students are projected to graduate 4 years later. If a different attrition rate were used, of course, the graduate component would change somewhat, but the overall impact on the total supply estimates would be minor. Under the basic methodology, for example, if a 10 percent attrition rate were used, only about 300 additional graduates would be expected over the projection period. If a 15 percent attrition rate were used, about 500 fewer graduates of optometry schools would be expected over the projection period.

Separation rates used in the basic methodology and in the alternative approaches were derived from age specific death and retirement rates for white males developed by the National Center for Health Statistics, 1/ and the Bureau of Labor Statistics. 2/

There was no evidence to suggest that optometrists, on the average, tend to live longer than males in the general working population. For this reason age specific mortality rates developed by the Department of Labor were applied to the optometrist population.

In contrast to the mortality experience, however, information does exist that suggests variation in retirement patterns between optometrists and all working males. For example, in comparing total male labor force participation rates with age-specific proportions of optometrists that are active (1973 Survey data), it was found that, in general, a higher proportion of optometrists were "active" for each age group. Based on these findings, published age-specific retirement rates for all male workers were adjusted to better reflect the apparent experience indicated for optometrists. Over the projection period, use of the adjusted series reduced estimated requirements of optometrists 25 percent below that obtained by not undertaking such a modification.

1/ Death rates from abridged life tables--U.S., 1969-71, white male and white female rates (unpublished 5-year age groups).

2/ Retirement rates are for the general male and female labor force, 1970, as published in Bureau of Labor Statistics. Length of Working Life for Men and Women--1970, Monthly Labor Review, pp. 31-35, February 1976.

Table VI-1. Schools of optometry and number of students and graduates: selected years, 1964-65 through 1975-76

Academic year	Schools	Students 1/ Total	Students 1/ First-year	Graduates
1975-76................	12	3,909	1,078	905
1974-75................	12	3,704	1,024	806
1973-74................	12	3,529	988	684
1972-73................	12	3,328	984	691
1971-72................	12	3,094	906	683
1970-71................	11	2,831	884	528
1969-70................	11	2,488	786	445
1968-69................	10	2,203	771	441
1967-68................	10	1,962	649	477
1966-67................	10	1,882	669	481
1965-66................	10	1,745	643	413
1964-65................	10	1,547	593	377

1/ Fall enrollment of undergraduate students.

Source: American Optometric Association.

Table VI-2. Enrollment and graduates in schools and colleges of optometry: 1975-76

School	Total enrollment	1st	2nd	3rd	4th	Graduates (1976)
Total	3,909	1,078	1,002	923	906	905
University of Alabama	107	41	23	20	23	22
Southern California College of Optometry	351	98	105	85	63	63
University of California	246	64	61	60	59	59
Illinois College of Optometry	570	151	145	136	138	138
Indiana University Division of Optometry	279	70	69	68	72	72
Massachusetts College of Optometry	298	91	80	59	68	68
Ferris State University, Michigan	21	21	-	-	-	-
State University of New York College of Optometry	106	41	23	22	20	20
Ohio State University College of Optometry	219	57	59	51	52	52
Pacific University College of Optometry	301	85	81	67	68	68
Pennsylvania College of Optometry	555	138	139	133	145	144
Southern College of Optometry	590	152	144	165	129	130
University of Houston College of Optometry	266	69	7[illegible]	57	69	69

Source: Council on Optometric Education, Annual Survey of Optometric Educational Institutions. Bureau of Health Manpower, Health Professions Schools, Selected Enrollment Data 1970-71/1977-78, October, 1976.

Table VI-3. First year enrollments and graduates in optometry schools under basic and alternative assumptions: actual 1971-72 through 1975-76, projected 1976-77 through 1989-90

Academic year	First-year enrollment			Graduates		
	Basic methodology	Alternative assumptions		Basic methodology	Alternative assumptions	
		Low	High		Low	High
1972-73...........	1,004	1,004	1,004	--	--	--
1973-74...........	989	989	989	794	704	794
1974-75...........	1,024	1,024	1,024	806	806	806
1975-76...........	1,078	1,078	1,078	884	884	884
1976-77...........	1,134	1,134	1,134	870	870	870
1977-78...........	1,153	1,134	1,153	901	901	901
1978-79...........	1,189	1,134	1,189	949	949	949
1979-80...........	1,189	1,134	1,201	998	998	998
1980-81...........	1,189	1,134	1,213	1,015	998	1,015
1981-82...........	1,213	1,134	1,249	1,046	998	1,046
1981-83...........	1,213	1,134	1,261	1,046	998	1,057
1983-84...........	1,213	1,134	1,274	1,046	998	1,067
1984-85...........	1,213	1,134	1,287	1,067	998	1,099
1985-86...........	1,213	1,134	1,300	1,067	998	1,110
1986-87...........	1,213	1,134	1,313	1,067	998	1,121
1987-88...........	--	--	--	1,067	998	1,133
1988-89...........	--	--	--	1,067	998	1,144
1989-90...........	--	--	--	1,067	998	1,155

Table VI-4. Supply of active optometrists and optometrist/population ratios, using basic methodology and alternative assumptions: actual 1970 and 1975, projected 1980-90

Projection series	1970	1975	1980	1985	1990
	Number of active optometrists				
Basic methodology...	18,400	19,900	22,000	24,400	26,700
Alternatives:					
Low................	18,400	19,900	22,000	24,200	26,100
High................	18,400	19,900	22,000	24,500	27,100
	Rate per 100,000 population				
Basic methodology...	9.0	9.3	9.9	10.4	10.9
Alternatives:					
Low................	9.0	9.3	9.9	10.3	10.6
High................	9.0	9.3	9.9	10.5	11.1

Source: 1970 active optometrists derived from data collected in the 1968 NCHS Vision and Eye Care Manpower Survey. 1975 active optometrists derived from data collected in the 1972-73 BHM Inventory of Optometrists conducted by the American Optometric Association.

Population: U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 601 (Series II). Total population as of July 1, includes armed forces overseas.

VII. PHARMACY

The nature and scope of pharmacy, the third largest health profession, is changing rapidly. In recent years pharmacy education has evolved toward a more clinically based program, largely brought about by concern over the under-utilization of pharmacists in their restricted role of compounding, counting and pouring drugs at the same time that patient misuse of drugs and non-compliance with practitioner instructions was rising. The new emerging clinical orientation of the profession will bring the pharmacist much closer to both the physician and the patient.

While some growth in numbers of pharmacists has taken place in recent years, substantial growth of the profession is expected in the future. Growth in the number of new pharmacists will be mitigated somewhat by the fact that an increasing proportion of pharmacy graduates will be women, and may be somewhat less likely than male pharmacists to work on a full-time basis.

The new HPEA legislation (P.L. 94-484) states that to be eligible for a grant under Section 770, each school of pharmacy must give assurance that their students will undergo a training program in clinical pharmacy. These programs are to include inpatient and outpatient clerkship experience in a hospital, extended care facility or other clinical setting; interaction with physicians and other health professionals; training in the counseling of patients with regard to the appropriate use of and reaction to drugs; and training in drug information retrieval and analysis in the context of actual patient problems. By 1990, approximately one half of all active pharmacists are expected to be trained in this manner. However, there will still be a substantial number of older pharmacists who are not so trained, and the role of these pharmacists in the delivery of health care will undoubtedly have to be reexamined.

There are a number of other developments relating to pharmacy that need to be watched. Foremost is the possibility that the supply of pharmacists may exceed the demand for their services, possibly in the mid-1980's. The current need for additional pharmacists appears less critical than in other health professions, and with the substantial increase in pharmacists projected to take place in the next decade or so, a situation could develop in which there may not be enough positions available for future pharmacy graduates, either nationally or in specific areas of the country. The substantial number of women entering the field is also expected to alter the practice of pharmacy, since this will mean that a far greater proportion of pharmacists may be employed on a less than full-time basis than at present. The effect these developments will have on the practice of pharmacy needs to be addressed.

Another development of potential consequence is the spread of health insurance plans that include reimbursement for the costs of prescription drugs. The pattern of financing of health services by third-party payment is rapidly becoming the norm, and any national health insurance program is very likely to include payments, in whole or in part, for prescription drugs, replacing the historical arrangement whereby the patient or client pays the pharmacist directly. The influence of such third-party payers could clearly affect the economics of retail pharmacy and the practice of pharmacy generally, although the direction is uncertain. Related issues of quality control and cost containment of pharmacy services will also likely affect the practice of pharmacy.

In the years ahead, according to the report of The Study Commission on Pharmacy, 1/ the greatest change in pharmacy may occur among those pharmacists engaged in dispensing. The shift to more organized and larger forms of health care delivery systems--such as hospitals, clinics, and HMO's-- may also change the place where many pharmacists work. The possible shift of dispensing pharmacists from solo practice to members of a group furnishing a comprehensive health service of which drug services are an integral part, will require increasing collaboration with other pharmacists and other health professionals. As a member of a health service organization, a pharmacist may be responsible for interacting with patients by reinforcing the physician's instructions about drug therapies and by keeping drug utilization records.

Numbers and Characteristics of Pharmacists

In 1973 there were approximately 116,600 active registered pharmacists in the United States. Some growth, although not substantial, in the numbers of active pharmacists has taken place in recent years. Nearly three-fourths of all pharmacists worked in community pharmacies. Of these, about one-half were in independent establishments, an additional one-fourth were in chain stores, and the remaining one-fourth worked in hospitals, nursing homes, government, education, or manufacturing. Overall, about one-third of the community pharmacists were proprietors, and two-thirds were salaried employees. Most of the pharmacists working in hospitals and nursing homes, government, education, or in manufacturing are probably salaried employees. (Table VII-1)

The proportion of pharmacists working in independently owned pharmacies has decreased significantly since 1966, when 68.5 percent either owned or worked in an independent community pharmacy. By 1973, this proportion had dropped to 47.0 percent. The proportion of

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1/ Pharmacists for the Future, the report of the Study Commission on Pharmacy, commissioned by the American Association of Colleges of Pharmacy, used by permission of AACP.

pharmacy practitioners working in chain pharmacies has risen from 14.0 percent to 26.7 percent during this same period. The percentage of pharmacists employed in hospitals has increased from 8.0 to 14.2 percent since 1966, while the numbers employed by the manufacturing and wholesale industries have remained relatively constant.

The age distribution of pharmacists by practice setting reveals much about the nature of the profession. Among younger pharmacists there appears to be a sharp trend away from independent pharmacies and toward chain pharmacies and hospitals. (Table VII-2) An increasingly large proportion of pharmacists employed by federal hospitals, private hospitals and chain pharmacies are under 30, while the percentage of young pharmacists practicing in independent pharmacies is much lower. This underscores the general trend away from independent pharmacies, and also may be an indication of preference among recent graduates for the security of an institutional work setting.

In essence, it has taken only about 20 years for pharmacy to change from a profession characterized by practitioners as pharmacy owners to one in which pharmacists are predominantly employees. As the health care system evolves and pharmacy continues to change with it, other changes in the employment status of pharmacists will undoubtedly take place.

In 1973, the average pharmacist worked about 44 hours a week at his primary place of practice (Table VII-3). Fifteen percent of all pharmacists had a secondary place of practice at which they averaged an additional 15 hours per week. Pharmacists working in community pharmacies had the longest work week, approximately 46 hours, while those employed in nursing homes had an average work week of only 37 hours. It would appear that pharmacists who work in nursing homes are mainly part-time employees. As the population continues to age, and the nursing home industry continues to grow, the effects of this trend on pharmacy manpower may increase in significance. Further changes in health care financing might also affect the need for pharmacy manpower in this area.

Of the estimated 147,800 licensed pharmacists in the United States in 1973, one out of five (21.1 percent) was classified as inactive, that is, not currently practicing pharmacy or pharmacy related work. This represents a potentially substantial pool of licensed non-practicing manpower for the profession, more so than in any other health profession except nursing.

Women and Minorities in Pharmacy

The most dramatic trend in pharmacy manpower is the dramatic increase in the number and percentage of women entering the profession. In the past, only a very small proportion of practicing pharmacists were female, but pharmacy is now in the midst of a change in the sexual composition of its manpower pool. For example, in 1950 only 4.0 percent of the active pharmacists were women. By 1970, this percentage had risen to 9.0 percent, and by 1973 to 11.0 percent. This trend is expected to continue for some time because the percentage of women enrolled in the final three years of study in colleges of pharmacy is steadily increasing. In 1963-64, 13 percent of the students in this class were female. By the 1976-77 academic year the proportion of females had risen to 37 percent.

The impact of the increased proportion and number of female practitioners will be felt in all areas of pharmacy, especially in hospital pharmacy. While women pharmacists, like male pharmacists, were most numerous in community pharmacies, they comprised over 28 percent of hospital pharmacists. The attraction of women to the institutional setting is easily understood because it offers a professional atmosphere and regularly scheduled working hours. providing for basic adaptation to the dual roles of career and family.

One of the concerns surrounding the employment of professional women is how to retain large numbers of them for more extended portions of their adult lives; that is, to increase their work-life expectancy, at least as measured by the average number of years spent in professional activity. A study of the career longevity of female pharmacists has revealed that their mean professional life is only about 16 years, primarily because of marriage and family-related responsibilities. 1/

Existing career patterns for professional women also indicate they frequently less than men, in terms of hours and weeks of work per year in professional practice. Although data on women in pharmacy are sparse, evidence indicates that the professional career of the average female pharmacist is shorter than that of the average male pharmacist. For this reason, there is a substantial interest in the growing number of women in pharmacy.

Overall, the percentage of active females in the pharmacy work force is projected to rise from 11.0 percent in 1973, to 19.1 percent by 1980, and to 30.8 percent by 1990.

In view of these projections, it seems clear that future developments among women in pharmacy must be watched very carefully to make certain that the career patterns of women pharmacists do not significantly reduce the availability of pharmacist services. The most obvious ways of increasing both male and female pharmacist productivity would seem to be increased use of subprofessionals and increased utilization of technology.

1/ Pharmacy Manpower Information Project, Feasibility Phase Report Number 1. American Association of Colleges of Pharmacy. NIH Contract No. 71-4178.

According to the pharmacy manpower information survey of 1973, only one of every 25 active pharmacist was a member of a minority group. The South Atlantic division had the highest proportion of Black American pharmacists, nearly one-third of whom were located in the District of Columbia. The Pacific Division had the largest proportion of Asian pharmacists, over 14 percent. The majority of Asian pharmacists were concentrated in the States of Hawaii and California, both of which have large Asian populations.

Pharmacists who are members of racial-ethnic minority groups tend to be concentrated in practice locations delivering primary care, that is, in community and hospital pharmacies (Table A-VII-1). Looking at the distribution for each racial-ethnic group, a slightly different pattern emerges. For example, black pharmacists tend to be more evenly distributed among the community and hospital categories than are white pharmacists, and Japanese and Chinese pharmacists are more evenly distributed than either of the above two groups.

Licensure Requirements

Initial licensure of pharmacists generally requires a minimum of five years of professional education, of which the last three or four must be in an accredited college of pharmacy. Applicants in every state except four must also complete a one year internship; a basic science certificate is required in Tennessee. The State Board of Pharmacy may prepare a written examination or they may use the national examination. According to the American Pharmaceutical Association, the National Pharmaceutical Licensure Examination (NABLEX) was first administered in 1970. By 1976, it was being used, at least in part in 44 states. 1/ Each State Board of Pharmacy determines the extent to which the examination is used. Practical and/or oral examinations are additional parts of the examination in some states. California and Florida are the only two States that do not have reciprocity agreements with other States.

Recent Developments in Licensure

Continuing education for pharmacists, as for several other health professionals, is becoming of increasing interest to the profession. Thirteen states require pharmacists to participate periodically in courses, programs, or seminars as a condition to license renewal. Although the precise programs are determined by the individual state boards. In the fall of 1975 the American Council on Pharmaceutical Education (ACPE), which is the nationally recognized accrediting agency in pharmacy, was requested to accept responsibility for developing a program to assure quality in pharmaceutical education.

1/ Blake, Martin I., Ph.D. "The National Pharmacy Licensure Examination: Recommendations for Change" J. Am. Pharm. Assn. V NS17, No. 6, June 1977.

Although participation in continuing education does not by itself assure that the practitioner is maintaining his competence, it is believed to be the most effective method available by which practitioners may update and enrich their qualifications.

Geographic Distribution of Pharmacists

According to the widely utilized measure most of evenness of geographical distribution of health professionals, pharmacists are the most evenly distributed of all the health professions. Recent developments indicate a continued movement toward greater evenness of geographic distribution of pharmacists. A factor that is likely related to the distribution of pharmacists is the fact that nearly all States have at least one school of pharmacy and that graduates of the schools have tended to practice in the State where they received their education. However, these graduates do not tend to concentrate in specific parts of the State but appear to be spread fairly evenly throughout.

In 1973, there were 55 pharmacists for every 100,000 persons in the United States. Table A-VII-2 shows the number and proportion of pharmacists by geographic division and State, including the District of Columbia and Puerto Rico. The New England Division had the highest pharmacist to population ratio (64 per 100,000 population), and the South Atlantic Division had the lowest, 49 per 100,000 population, These differences between high and low ratios are much smaller than in other health fields. Among individual States, the ratios ranged more widely, from a high of 81 per 100,000 population in the District of Columbia and 71 in the State of Massachusetts, to a low of 29 in Hawaii.

Unlike other health professionals, pharmacists are relatively evenly distributed between metropolitan and non-metropolitan areas. Metropolitan areas have about three times the population of the non-metropolitan areas and have only slightly more than three times the number of pharmacists. Stated another way, the 73 percent of the population in metropolitan areas are served by a nearly matching proportion (76 percent) of the active pharmacists. There is also relatively little difference in the ratio of pharmacist-to-population between large and small SMSA's.

Counties in SMSA's of one million or more population had 58 pharmacists per 100,000 population while those in SMSA's of under 100,000 population had 52 pharmacists per 100,000 population. In non-metropolitan counties, a similar pattern is apparent although the differences are somewhat greater. For non-metropolitan counties with the largest central cities (i.e., of 25,000 population and over), the average number of pharmacists was 55 per 100,000 population, about the same as the ratio for metropolitan areas. Similarly, the number of counties in the Nation without a pharmacist was comparatively smaller than any other health profession. As pharmacists enter health manpower shortage areas under Section 322 of the Public Health Service Act, variations among and within geographic areas should continue to lessen.

Pharmacy Education

Although length of educational programs in pharmacy schools varies little between schools, schools have several combinations of years needed to obtain a pharmacy degree. The American Association of Colleges of Pharmacy compiles comprehensive enrollment statistics for only the final three years of study, since these years represent the only years of pharmacy education common to all schools. In 1976-77, the 72 colleges of pharmacy had a total of 24,082 students enrolled in the 3 professional years of study, with 8,208 students enrolled in the third-to-last year class (Table VII-4).

Enrollments in pharmacy schools have grown substantially over the last decade and a half, primarily since the late 1960's. Between the academic years of 1962-63 and 1965-66, third-to-last year enrollments grew only at an average annual rate of less than 3 percent a year. During the period from 1965-66 through 1974-75, following enactment and implementation of the Health Professions Educational Assistance Act of 1963, pharmacy schools experienced an average annual growth rate three times that great, or nearly 9.0 percent, in third-to-last year enrollments. Beginning in 1975-76, however, enrollments began to decline. In the fall of 1975 there was a decrease of 0.3 percent in third-to-last year enrollments, and a further decline of 6.1 percent in the fall of 1976. Much of this decrease appears to be due to the stabilization of male enrollments. Third-to-last year enrollments for males decreased by 941 or 18.9 percent in this two year period, while female enrollments continued to rise, increasing by 415, or 14.7 percent. In 1976, the proportion of women in the third-to-last year class was nearly two-fifths of the total, up from just over one-fifth in 1970.

In the fall of 1976 American students of minority racial-ethnic heritage represented nearly 9.0 percent of the total student population in colleges of pharmacy, up moderately from recent years. There were 938 Black Americans (4.0 percent of the total enrollment), 725 Asian American (3.1 percent), 353 Hispanics (1.5 percent), 37 American Indians (0.2 percent) and 36 others (0.2 percent). The four predominantly minority colleges of Texas Southern, Florida A & M, Xavier and Howard Universities continue to enroll just over one-half of the Black American pharmacy students. Since total enrollments in pharmacy schools appear to be stabilizing, minority enrollments may not increase significantly in the near future.

Trends in Pharmacy Education

To implement the necessary curriculum changes for clinically based programs, pharmacy educators have utilized general educational program tools, including the study of desired performance skills, the development of a competency-based curriculum and the use of a role model. They have often incorporated self-paced instructional programs, frequently utilizing computer assisted instruction (C.A.I.) to meet the needs of students with different learning styles. Efforts are also being made to continue examining the various levels of desired practice performance and corresponding preparation.

Curriculum emphasis has also shifted from the physical sciences to the biological sciences. This has also been described as a shift from "drug product orientation to patient orientation," and has greatly affected pharmacy educational programs. For example, an appreciation of patient compliance with medication instructions, especially among the aged, has resulted in greater emphasis and study in this area. Also, the size of pharmacy faculties has expanded to include clinical staff that can provide relevance to classroom instruction and also serve as "role models" in the clinical setting. The American Council on Pharmaceutical Education now requires a clinical program of its accredited colleges, and this has provided further emphasis in this direction. Such programs may be quite varied since they generally reflect the practice opportunities available to graduates in the schools geographic area.

In the clinical practice programs, an interdisciplinary health-care team concept is often incorporated. Advanced students rotate through the clinical areas with students of other health professions, with the aim of improving communications between practitioners and patients. As a part of this trend toward establishment of support with patients, pharmacy students representative of the patient populations they will serve have been recruited. This has been demonstrated by the increasing proportions of women and minorities entering pharmacy education programs.

It is anticipated that such clinical practice programs will, in time, replace the traditional internship or apprenticeship program that traditionally followed graduation and preceded licensure. As such, the clinical internship programs are becoming a responsibility of the schools of pharmacy. Many schools are also becoming quite active in developing and sponsoring continuing education programs for pharmacy practitioners, particularly as States require a demonstration of competency to obtain re-licensure. The expansion of programs into the clinical areas has however, considerably increased educational program costs.

Projections of the Supply of Pharmacists

The projections presented here indicate the approximate future levels of pharmacy manpower under given assumptions. The enrollment in colleges of pharmacy is clearly the basic determinant of the future supply of pharmacists. As indicated earlier, enrollments in pharmacy schools increased rapidly during the period of massive Federal financial support. Current Federal legislation is not aimed at encouraging continued enrollment increases, and; as a result, pharmacy enrollments appear to be stabilizing.

Three projection methodologies have been used here to project future enrollments and graduates for pharmacy schools. Under the basic, or most likely assumption, total third-to-last year enrollments will not increase beyond the 1976-77 level of 8,208 students per year. However, female enrollments for this period are projected to increase by 150 students a year until 1980, then stabilize. Male third-to-last year enrollments are projected to decrease by this same amount. The methodology assumes that there will be no new schools beyond the 72 currently existing schools.

It is not possible to develop precise attrition rates for pharmacy students, because no longitudinal data are available. Based on recent experience attrition rates of 7.4 percent for males and 5.4 percent for females have been used to generate male and female graduate components to 1990. Using these rates, 92.6 percent of the male and 94.6 percent of the female third-to-last year students are expected to graduate 3 years later.

Under the basic methodology, it is projected that future graduating classes will produce a total gross graduate input of 128,820 for the 1974-90 period. Using the basic assumption the supply of active pharmacists is projected to grow from 116,562 in 1973 to 144,300 in 1980, and to 185,400 by 1990, this represents a total increase of approximately 69,000 pharmacists over the projection period. The male pharmacist supply is projected to decrease from 89.0 percent of total active pharmacists in 1973, to 80.9 percent in 1980, and is expected to further decline to 69.2 percent by 1990. Under this same assumption, the female supply is projected to increase from 11.0 percent in 1973, to 30.8 percent by 1990 (Tables VII-5 and VII-6).

It is not possible at this point to predict exactly what effect the increasing proportion of female pharmacists will have on the future pharmacy manpower work force. There is a strong possibility that the changing sex mix of the profession could have a major effect on the quantity of pharmacy manpower in the future, as it has been estimated that the professional career of women pharmacists is approximately one-half that of the average male pharmacist. 1/ If these work patterns prove, in fact, to be true, then women pharmacists have a career equivalent about one-half that of males. This of course would reduce the supply of pharmacists services accordingly. It is a development that needs to be watched very carefully.

1/ Pharmacy Manpower Information Project. Feasibility Phase Report-1. American Association of Colleges of Pharmacy. Contract No. NIH 4178.

Under the low alternative enrollment assumption, the decline in third-to-last year enrollments which began with the 1975-76 academic year is projected to continue but at a reduced rate at least until 1980 before leveling off. Total third-to-last year enrollments are expected to decrease by about 1.6 percent a year until 1980-81. Male enrollments will reflect most of the decrease, while female enrollments will continue to increase until 1980-81, when they will have reached approximately 48 percent of the third-to-last year class.

Under the high alternative assumption, increases of about 1.5 percent a year in third-to-last year enrollments are projected to begin again in 1977-78 and continue until 1980-81, then gradually decrease to a 0.5 percent increase through 1985-86 before leveling off. Again, most of the decrease will be reflected in male third-to-last year enrollments. The high alternative projects a total gross graduate input of 135,083, approximately 11,000 more than is projected under the low assumption.

Pharmacists and the Delivery of Care

Future requirements for pharmacy are heavily dependent on the role that pharmacists will play in the Nation's health care system in the coming years. The report of the Study Commission on Pharmacy 1/ postulates that pharmacists are health professionals who could make an important contribution to the health care system by providing information about drugs to consumers and other health professionals. However, pharmacy is and will remain a differentiated profession in that all pharmacists do not possess or utilize the same knowledge and professional skills in every practice setting. The practice characteristics of a pharmacist in an independent community pharmacy, for example, are different from those of a pharmacist practicing in a hospital. Substantial differences in the character of total professional knowledge and skill may also exist, such as differences between the hospital staff pharmacist and the community pharmacist or between the pharmacist engaged in teaching at a large university or one employed by a drug manufacturer.

Another factor to be considered is that pharmacists spend a considerable amount of time in non-dispensing activities. A recent study has shed much light on how the large group of pharmacists in community pharmacies spend their time and deliver care. 2/ The study determined that a pharmacist practicing in a community pharmacy setting is engaged in activities categorized as "productive" only part

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1/ Pharmacists for the Future, op, cit.
2/ Rodowskas, C. A., Jr., and Dickson, W. M. Feasibility Phase Report-1, Pharmacy Manpower Information Project. NIH Contract No. 71-4179, American Association of Colleges of Pharmacy.

of the time. Although more than two-thirds of their activities were related to prescription and legend drug activities, non-health related activities accounted for one-fourth of their time, while idle time accounted for nearly one-fifth of their time. The study also found that pharmacists practicing in community pharmacies devoted a significantly higher proportion of their time to communication with patients than did pharmacists in other settings.

A more direct measure of the pharmacist's role in the delivery system, however, is the number of persons served personally each day. On the average, each pharmacist services 118 persons daily, the number of persons varying by setting and by whether or not a pharmacist utilizes non-pharmacist aides. Pharmacists employed by large chain commercial pharmacies on the average serve more persons daily than do pharmacists employed by smaller chain or independent community pharmacies, who serve about one-third fewer persons daily. Those in clinical or medical buildings serve about as many persons as pharmacists employed in small chains. Pharmacists employed in hospitals serve, on the average, somewhat more persons than in other settings. Those in nursing homes serve somewhat fewer persons, on the average.

The number of aides utilized by pharmacists is related directly to the number of persons the pharmacist is able to serve individually, a basic measure of pharmacist productivity. The vast majority of pharmacists (about five out of six) work with one or more aides or non-pharmacist auxiliaries. Pharmacists who do not utilize aides serve, on the average, about 101 persons daily. Although one aide appears to make only minimal difference in pharmacist productivity, utilization of more than one aide increases pharmacist productivity measurably. The employment of three or more aides allows the pharmacist to increase productivity, on the average, by about 15 percent. The use of non-conventional devices by the pharmacist, such as programmable typewriters and pre-packing equipment, also relates to increases in productivity.

In the years ahead, pharmacy and pharmacists can be expected to improve the efficiency of the process by which prescription drugs are dispensed. This efficiency can be accomplished by exploiting opportunties for mechanization and automation for the performance of routine and nonprofessional tasks. This will require the use of more workers in technical and clerical roles, freeing the fully-trained pharmacist to do tasks which require his knowledge and skills, and to become more concerned with patients and their well-being in relationship to drugs.

Projected Requirements for Pharmacists

Although it is difficult to forecast the exact number of pharmacists required in the future, indications are that requirements for pharmacists may not increase as rapidly as the supply of these health professionals. However, a number of factors must be taken into consideration which might mitigate the likelihood that the supply might exceed the requirements for pharmacists.

One measure of requirements for pharmacists is the optimum ratio of 62.5 pharmacists per 100,000 population utilized by the profession. On this basis, 153,200 pharmacists would be required in 1990, as compared with a projected supply of 185,400 in that year. Another method for estimating pharmacy requirements to 1990, utilizing the highest current State ratio of pharmacists to population as a standard, results in an estimated requirement of 173,800 pharmacists in 1990, still somewhat below the projected supply. The Soar general model indicates a requirement for pharmacists about in line with the projected supply.

Looking more closely at the projected mix of pharmacists by sex in 1990, however, gives a somewhat clearer requirements-supply picture. On this basis, the full-time equivalent supply of active pharmacists will likely be substantially fewer than the actual number of 185,400 pharmacists projected. In that year, the proportion of active women pharmacists may have nearly tripled over current levels, and the aggregate number of women in the profession may have increased more than four-fold. Because of the shorter working life for women and their proclivity toward part-time employment, the number and ratio of full-time pharmacists is expected to be less than the aggregate totals would imply. It is likely, therefore, that supply and requirements for pharmacists will be much more closely in balance than would appear initially on the basis of full-time equivalent pharmacists.

Another area of possible growth is in expansion of hospital pharmacy services. Projections based upon existing unit dose medication technician-clinical pharmacists systems indicate that over 70,000 hospital pharmacists would be required if this level of service were to be available on all general medicine and surgery beds today. The expansion of beds and the extension of the clinical service to 24-hour availability would also increase the requirements.

Data and Analytical Needs

The data collected in the 1973-74 inventory of pharmacists by the American Association of Colleges of Pharmacy and supported by the Bureau of Health Manpower represents the latest available data on pharmacists in the Nation. Although presently somewhat dated, these data provide an adequate base for some descriptive and analytical efforts. More frequent collection of data on pharmacists is needed to provide more current information which is particularly necessary for work requiring small area geographic analysis, such as designation of pharmacy manpower shortage areas.

Pharmacy is one of the 13 occupations included in the Cooperative Health Statistics System (CHSS) under the auspices of NCHS, and plans call for frequent updating of the inventory data base when resources permit. Although CHSS statistics on a current basis would provide much of the immediate data for analytical needs for pharmacists, other areas of interest are not adequately measured. Data are needed on the emerging role of pharmacists in the clinical area and on newly graduated pharmacists.

Comparability With Other Data

The data on pharmacy manpower used in this report are derived from the 1973 inventory of pharmacists conducted by the American Association of Colleges of Pharmacy (AACP) and supported under contract by the Bureau of Health Manpower, HRA. Estimates based on these data are not comparable with earlier estimates of pharmacy manpower released by the National Association of Boards of Pharmacy (NABP) and are about 10 percent lower than those published by NABP. The NABP estimates did not adequately reflect the fact that a substantial proportion of pharmacists hold licenses in more than one State. The current AACP data allows for this fact; therefore; those pharmacists who may be eligible to practice in more than one State were only counted once. Although the current report is based on the most complete and accurate data on pharmacists available, much research still needs to be done.

The figures for community, hospital and nursing home pharmacists are probably complete, since all such pharmacists are engaged in dispensing drugs. The laws of several states and jurisdictions require that pharmacists be registered in order to dispense drugs. However, a pharmacist does not now have to be registered or licensed to teach pharmacy, to hold a pharmacy position in government, or to work in a pharmaceutical capacity for a drug manufacturer or distributor, or even in a drug information center. Hence, one might conclude that the figures may understate the number engaged in pharmacy activities other than those in community and hospital pharmacy.

Pharmacist Projection Methodology

Estimates of the number of active pharmacists for 1974-90 are based upon the number of active pharmacists, by age, as of December 31 of each year, plus new graduates, and attrition to both groups. Using the base-year age distribution of pharmacists, new graduates were added year by year to those pharmacists active as of December 31 and to the new graduates. Age-specific separation rates were then applied to these totals. Estimated "losses" due to deaths and retirements 1/ were then subtracted, by age group, from the active pool, with the pool being aged by 1 year each time.

1/ Losses due to retirement are based on a Bureau of Labor Statistics Report by Fullerton, Howard N. Jr. Length of Working Life for Men and Women, 1970. Monthly Labor Review. pp 31-35, February, 1976.

Losses due to death were developed by using the mortality experience of white males and females, 1970. National Center for Health Statistics.

Current graduate and enrollment statistics were obtained from annaul reports published by the American Association of Colleges of Pharmacy (AACP).

Graduate projections were computed for the basic supply methodology and for the two alternative supply assumptions from the number of third-to-last year students reported three years earlier.

Table VII-1. Number of active pharmacists by sex and place of practice: 1973

Place of practice	Total active pharmacists	Percent	Total active males	Percent	Total active females	Percent
Total	116,562	100.0	103,732	100.0	12,830	100.0
Independent community pharmacy	54,884	47.0	50,418	48.6	4,466	34.8
Small chain community pharmacy	13,144	11.3	11,915	11.5	1,229	9.6
Large chain community pharmacy	17,929	15.4	16,331	15.7	1,598	12.5
Clinic or medical building pharmacy	4,438	3.8	3,746	3.6	692	5.4
Nursing home	498	0.4	364	0.4	134	1.0
Private hospital	10,798	9.3	7,756	7.5	3,042	23.7
Government non-federal hospitals	3,622	3.1	2,794	2.7	828	6.5
Other State and local government	1,300	1.1	1,052	1.0	248	1.9
Government federal hospital (including military)	2,100	1.8	1,903	1.8	197	1.5
Other federal government	340	0.3	310	0.3	30	0.2
Pharmaceutical manufacturer	5,119	4.4	4,990	4.8	129	1.0
Pharmaceutical wholesaler	443	0.4	418	0.4	25	0.2
College of pharmacy	1,418	1.2	1,265	1.2	153	1.2
Other	533	0.5	474	0.5	59	0.5

Source: Pharmacy Manpower Information Project: American Association of Colleges of Pharmacy, 1973. NIH Contract No. 71-4178.

Table VII-2. Percentage of active pharmacists by age group and place of practice: 1973

Place of practice	Age group						
	Less than 30	30-39	40-49	50-59	60-64	65-69	70 or older
Independent community pharmacy	8.7	22.1	27.0	19.1	8.6	7.8	6.7
Small chain community pharmacy	17.4	29.5	24.3	14.8	5.8	5.0	3.2
Large chain community pharmacy	22.8	31.9	21.2	13.8	5.1	3.5	1.7
Clinic or medical building pharmacy	14.4	27.1	27.3	16.2	6.4	5.2	3.4
Nursing home	13.5	24.9	20.5	14.2	7.6	8.6	10.7
Private hospital	27.1	31.5	18.1	11.8	5.3	3.8	2.4
Government non-federal hospitals	25.1	29.1	20.8	14.0	5.1	4.1	1.8
Other State and local government	[illegible]	22.6	20.3	21.8	9.5	7.2	3.0
Government federal hospital (including military)	35.2	24.9	16.2	19.3	3.1	1.1	0.2
Other federal government	17.0	26.5	28.6	21.1	3.7	2.4	0.7
Pharmaceutical manufacturer	5.9	27.2	32.6	22.7	8.0	2.9	0.7
Pharmaceutical wholesaler	1.8	12.8	27.7	19.1	19.6	12.0	7.0
College of pharmacy	21.1	35.4	20.7	15.4	4.2	2.2	1.0
Other	10.6	34.0	23.4	14.8	7.2	6.5	3.5

Source: Pharmacy Manpower Information Project: American Association of Colleges of Pharmacy, 1973. NIH Contract No. 71-4178.

Table VII-3. Proportion of pharmacists by place of practice and by average workweek at principal and secondary locations: 1973

Place of practice	Principal location		Secondary location	
	Proportion of practitioners (percent)	Average hours worked per week	Proportion of practitioners (percent)	Average hours worked per week
All places	100.0	44	100.0	15
Independent pharmacy	47.0	46	18.4	14
Chain pharmacy	26.7	44	11.2	15
Clinic	3.8	43	9.5	15
Nursing	0.4	37	29.1	16
Hospital	14.2	40	18.0	16
Manufacturer	4.4	44	1.6	15
Other	3.5	43	12.2	15

Table VII-4. Trend in number of schools, enrollments, and graduates for pharmacy schools: academic years 1963-64 through 1976-77

Academic year	Number of schools	Enrollment in final three years			Enrollment third-to-last year			Graduates		
		Total	Male	Female	Total	Male	Female	Total	Male	Female
1963-64.............	76	10,291	8,922	1,369	4,390	3,780	610	2,195	1,943	252
1964-65.............	75	12,104	10,409	1,695	4,491	3,885	606	3,393	2,893	500
1965-66.............	74	12,495	10,683	1,812	4,647	3,954	693	3,704	3,139	565
1966-67.............	74	13,221	11,152	1,916	5,234	4,474	760	3,782	3,252	530
1967-68.............	74	14,274	11,788	2,334	5,616	4,578	4,038	4,035	3,394	641
1968-69.............	74	14,932	12,069	2,684	5,469	4,385	1,084	4,291	3,565	726
1969-70.............	74	15,323	12,104	3,188	5,532	4,276	1,256	4,758	3,856	902
1970-71.............	74	15,626	11,956	3,370	5,864	4,515	1,349	4,747	3,749	998
1971-72.............	74	16,808	12,621	4,187	6,532	4,849	1,683	4,788	3,656	1,132
1972-73.............	73	48,956	13,936	5,020	7,546	5,452	2,094	5,184	3,858	1,326
1973-74.............	73	21,289	15,258	6,029	8,342	5,834	2,508	5,957	4,309	1,648
1974-75.............	73	23,235	16,168	7,067	8,734	5,910	2,824	6,712	4,825	1,887
1975-76.............	73	24,416	16,303	8,113	8,710	5,601	3,109	7,757	5,352	2,405
1976-77.............	72	24,082	15,226	8,856	8,208	4,969	3,239	NA	NA	NA

Source: Enrollment Report on Professional Degree Programs in Pharmacy, Fall 1976. American Association of Colleges of Pharmacy. Also prior annual editions.

Note: Enrollment figures are for the 3 professional years; third-to-last year figures represent the first year of the final three years.

Data for the University of Puerto Rico are excluded from enrollment and graduate figures for 1963-64.

Table VII-5. Supply of active pharmacists, using basic methodology and alternative assumptions: actual 1973, projected 1974-1990

Projected series	1973	1975	1980	1985	1990
	Number of active pharmacists 1/				
Basic methodology......	116,600	122,500	144,300	165,200	185,400
Alternatives:					
Low..................	116,600	122,500	144,100	163,100	181,000
High.................	116,600	122,500	144,400	167,400	191,300
	Rate per 100,000 population 2/				
Basic methodology......	54.7	56.6	63.8	69.5	74.5
Alternatives:					
Low..................	54.7	56.6	63.7	68.6	72.7
High.................	54.7	56.6	63.9	70.4	76.9

1/ Includes licensed pharmacists in the United States and Puerto Rico.

2/ Resident population as of July 1, for 50 States and the District of Columbia. Resident population for Puerto Rico has been estimated based on Bureau of the Census population of Puerto Rico for 1973.

Source: 1973 active pharmacists: Unpublished data from NIH Contract No. 71-4178. Pharmacy Manpower Information Project, American Association of Colleges of Pharmacy, 1973.

Population: U.S. Bureau of the Census. Current Population Reports. Series P-25, No. 601.

Table VII-6. Third-to-last year enrollments and graduates in pharmacy schools, by sex under basic assumption: actual and projected

Academic year	Third-to-last year enrollment 1/			Graduates 1/		
	Total	Male	Female	Total	Male	Female
1973-74......	8,342	5,834	2,508	5,957	4,309	1,648
1974-75......	8,734	5,910	2,824	6,712	4,825	1,887
1975-76......	8,710	5,601	3,109	7,549	5,227	2,322
1976-77......	8,208	4,969	3,239	7,910	5,295	2,615
1977-78......	8,208	4,819	3,389	7,897	5,018	2,879
1978-79......	8,208	4,669	3,539	7,451	4,452	2,999
1979-80......	8,208	4,519	3,689	7,455	4,317	3,138
1980-81......	8,208	4,369	3,839	7,410	4,183	3,227
1981-82......	8,208	4,369	3,839	7,465	4,049	3,416
1982-83......	8,208	4,369	3,839	7,469	3,914	3,555
1983-84......	8,208	4,369	3,839	7,469	3,914	3,555
1984-85......	8,208	4,369	3,839	7,469	3,914	3,555
1985-86......	8,208	4,369	3,839	7,469	3,914	3,555
1986-87......	8,208	4,369	3,839	7,469	3,914	3,555
1987-88......	8,208	4,369	3,839	7,469	3,914	3,555
1988-89......	8,208	4,369	3,839	7,469	3,914	3,555
1989-90......	--	--	--	7,469	3,914	3,555
1990-91......	--	--	--	7,469	3,914	3,555

1/ Enrollments for the Fall of 1973-76 are actual. Graduates are actual through the Spring of 1974-75.

VIII. PODIATRY

Although podiatry is the smallest health profession, it plays a significant and expanding role in the provision of health care, by diagnosing, treating, and preventing abnormal conditions of the feet. However, physicians-- general medical practitioners and orthopedic surgeons-- also provide care for foot disorders, and the provision of specific podiatric services by these medical practitioners must be examined closely.

A number of developments and trends are expected to affect the role of the podiatrist in the health care system and in the provision of foot care services. The apparent tendency of new graduates to go into multiple practitioner relationships is changing the way in which podiatric care is provided. The provision of specific services by the general medical practitioner or orthopedic surgeon is little understood currently, but could have a major impact on geographic area needs for podiatric services. Another development that may have a significant impact upon the podiatrist's productivity and ability to fulfill the demand for services is the increased use of full-time podiatric assistants by newly licensed podiatrists. The training of newly graduated podiatrists, which permits them to perform a wider variety of services, is also expected to have a significant effect on the provision of podiatric care, as are increased State requirements for continuing education. These and other developments which have an impact directly on the role of podiatrists and the requirements for their services will be discussed in more detail in the sections that follow.

The number of podiatrists has remained relatively constant in recent years, and has failed to keep pace with population growth. Despite an anticipated major increase in the supply of podiatrists in the years ahead, there will likely continue to be a shortage of podiatrists in the United States. The geographic maldistribution of podiatrists is also a major current concern. Relative to other health professions, podiatrists are far more clustered in urban, densely populated areas of the nation, particularly in areas close to where they received their training. While substantial growth is expected in the next fifteen years, the geographic distribution of podiatrists is not expected to change drastically.

Numbers and Characteristics of Podiatrists

In contrast to other health professions, new graduates entering podiatry have been barely sufficient to offset the number leaving the profession during the recent past. Between 1970 and 1974, the two most recent years for which data are available, the number of active podiatrists remained nearly constant at about 7,100. Although the overall supply changed very little in this period, substantial changes in supply occurred on a regional basis. The number of active podiatrists increased by 14 percent in the South and 6 percent in the West, but declined by 5 percent in the North Central Division. In spite of a decline of 4 percent in the number of active podiatrists in the Northeast, the ratio of podiatrists to population was still about three times greater in that division than in the South.

The age distribution of active podiatrists clearly illustrates the preponderance of older podiatrists in the profession (Table A-VIII-1). Only one of five podiatrists active in 1974 was under 35 years of age, contrasted with approximately twice that proportion who were over 54 years of age. This reflects not only the relatively small growth in podiatry graduates in recent years, but also the fact that large numbers of graduates entered the field in the late 1940's and early 1950's following World War II. The median age of all active podiatrists in the United States in 1974 was 51.0 years, and has actually increased somewhat in recent years, unlike most other health professions. However, Attrition among older podiatrists and increases in the active supply of podiatrists are expected to reduce the median age of podiatrists in the future.

There are few women podiatrists. Only 272, or less than 4 percent of the total of 7,120 active podiatrists in 1974 were female. The proportion and number of female podiatrists declined somewhat in the early 1970's. Since one of every four female active podiatrists was 65 years old or older in 1974 (as compared with only one of every eight male podiatrists), this trend may continue for a few years in spite of recent increases in the number of female podiatry students and graduates.

In contrast to other health professions, minorities in podiatry have increased little in recent years. Members of minority groups constitute less than 4 percent of active podiatrists, and although their numbers are expected to increase somewhat in future years, their proportion of active podiatrists is likely to remain small.

Even though the number of active podiatrists has not increased in recent years, the proportion of full-time podiatrists in patient care (those devoting 35 or more hours per week) actually declined. In addition, median hours per week spent in patient care activities also declined. Although the number of younger podiatrists (those under 35 years) who spend more time in patient care activities has been rising, this has been more than offset by the decline in hours spent in patient care by older podiatrists. As in most health professions, the proportion of podiatrists working less than full-time increases with age. Nearly one of 10 podiatrists age 55 years and over worked less than 20 hours, as contrasted with only one of 50 podiatrists under age 35 working this amount of time.

Nearly all active podiatrists are currently self-employed, and the proportion has actually been increasing in recent years (Table A-IX-2). Although solo practitioners account for 80 percent of all active podiatrists, there appears to be a tendency for younger practitioners to move into other forms of practice, particularly into multiple-practitioner relationships. Only 6 of 10 active podiatrists under age 35 were engaged in solo practice in 1974, in contrast to 9 of 10 active podiatrists age 65 and older. Similarly 17 percent of the active podiatrists aged 35 to 44 were in partnerships or groups in 1974, while only 5 percent of the active podiatrists age 65 and over were so engaged.

Although specialization within podiatry has been increasing in recent years, more than four-fifths of all active podiatrists are primarily engaged in general practice. About 1 in 10 podiatrists are engaged primarily in surgery, while even smaller proportions are in foot orthopedics, biomechanics, or podogeriatrics. Older podiatrists are far more likely to be engaged in general practice and less likely to be primarily engaged in a specialty, particularly surgery. While 26 percent of podiatrists under age 35 are primarily engaged in surgery, this proportion decreases with age to a low of 3 percent for active podiatrists 65 years old or older. In contrast, the proportion of podiatrists primarily engaged in general practice rises with age, going from 68 percent of those under age 35, to 91 percent of those age 65 years and older.

Licensure

Podiatrists are required to have a license to practice in all States and the District of Columbia. Pre-professional college requirements vary, with 20 states requiring two years, 11 states one year and 19 states having no specific requirements. Completion of a four-year course at a school of podiatry is required to obtain a license, and an intern- ship is an additional requirement in a few States.

Podiatrists are regulated primarily by the boards of medical examiners. Although the boards had no representation by podiatrists for many years, States have recently been creating a central State department of which each professional board is a part and have been appointing at least one podiatrist to participate.

Twenty-four States require podiatrists to participate in some form of continuing education program. In the practice of podiatry as in other health fields, the requirement for continuing education has increased in the past few years.

Geographic Distribution

By most measures of determining evenness of distribution of health resources, podiatrists are the most unevenly distributed of all health professionals. Furthermore, geographic maldistribution of podiatrists has improved little in recent years as compared with other health professions. This maldistribution can be measured in a number of ways. For example, substantial differences exist among states in the availability of podiatrists, with the ratio of active podiatrists to population differing by 17 times between the highest and lowest ratio states.

One important aspect of this maldistribution is that the five States with schools of podiatry had among the highest ratios of active podiatrists to population and accounted for more than one-half of all active podiatrists in 1974. New York had the highest State ratio of active podiatrists to population - 6.8 per 100,000 population. Massachusetts had a ratio of 6 per 100,000; Pennsylvania and Rhode Island had ratios of 5.7 per 100,000; and Illinois and Ohio had ratios of active podiatrists to population of 5.1 and 4.8 per 100,000 respectively. In contrast, ten States--Alabama, Alaska, Arkansas, Hawaii, Louisiana, Mississippi, North Carolina, North Dakota, South Carolina and Tennessee--had one or fewer active podiatrists per 100,000 population. The net result of these State disparities is that the ratio of podiatrists to population in the geographic divisions varies widely. The ratio was 6 per 100,000 in the Middle Atlantic States and less than 1 per 100,000 in the East South Central States, a range of more than 6 to 1.

Like most health professionals, podiatrists are heavily concentrated in metropolitan areas. Counties in SMSA's had an average ratio of 4 podiatrists per 100,000 population, whereas non-metropolitan counties had an average ratio of only one active podiatrist per 100,000 population. Overall, Only a minority of counties, slightly more than one of four in 1973, had even one active podiatrist. As indicated previously, there is a very strong relationship between where podiatrists go to school and where they practice, and the five states with podiatry schools had the greatest number and proportion of counties with the "best" ratios of under 21,000 persons per podiatrist (nearly 5 per 100,000 population). Health Service Areas showed a similar maldistribution. Sixteen of the nation's 200 plus Health Service Areas had no active podiatrist in 1974, and an additional 107 (or more than one half of all HSA's) had two or fewer podiatrists per 100,000 population, far less than the national average.

Although the location of their school of graduation clearly plays a major role in determining where podiatrists practice, other factors also are important. Other major considerations appear to be the currency of State practice acts in relation to the scope of practice for which students are trained, the opportunity to obtain hospital or clinic privileges, location of graduate residency training, coverage of services under Medicaid, Blue Shield, and other third party payment mechanisms, and relevancy of licensing requirements to podiatry and to current podiatric medical education. Cultural, social, and family considerations, however, are also important.

Podiatric Education

The Council on Podiatric Education of the American Podiatry Association accredits professional degree programs in podiatry. The five colleges of podiatric medicine in the United States admit students who have already completed at least 2 years of college, with a subsequent 4 years of training leading to the degree of doctor of podiatric medicine (D.P.M.).

In academic year 1976-77, all five active schools of podiatry were operated as private institutions. Two of the schools are located in the Northeast: New York College of Podiatric Medicine in New York City and the Pennsylvania College of Podiatric Medicine in Philadelphia. Two schools are located in the North Central States: Illinois College of Podiatric Medicine in Chicago, and the Ohio College of Podiatric Medicine in Cleveland. One school, the California College of Podiatric Medicine in San Francisco, is located in the West. A sixth school at the State University of New York in Stony Brook closed one year after opening in academic year 1975-76.

The five schools of podiatry graduated 496 students in 1976, a substantial increase over the levels of the 1950's and 1960's. Nearly 30 percent of the total (or 145 students) graduated from one school--the California College of Podiatric Medicine.

About 15 percent of the 496 graduates in 1976 were women, with the number expected to rise somewhat in the following years. Members of minority racial-ethnic groups accounted for 37 or 7.4 percent of the graduates. As with women, the number and proportion of minority group members in graduating classes of podiatric medicine is expected to rise.

In academic year 1976-77, the five schools of podiatric medicine enrolled a total of 2,295 students (Table A-VIII-4). The Illinois College of Podiatric Medicine has the largest total enrollment, 609 students or nearly 27 percent of all podiatry students. First year enrollments in all schools totalled 650 students, with Illinois College of Podiatric Medicine also having the largest number of first year students, 171.

Enrollments and graduates in Schools of Podiatric Medicine are currently at their highest levels in history, after several decades of very low levels (Table A-VIII-5). In academic year 1951-52, the 8 schools of podiatric medicine enrolled 1,633 students and graduated 476 students. During the decade of the 1950's enrollments and graduates declined sharply, reaching 478 students and 116 graduates in academic year 1960-61. Coincident with the enactment and implementation of the Health Professions Educational Assistance Act of 1963, enrollment and graduates began to rise sharply. Total enrollment reached 2,295 students in academic year 1976-77, an increase of nearly 270 percent over the level only 12 years earlier.

Similarly, first year enrollments and graduates have also risen dramatically.

In the 1975-76 academic year about 100 or just under 5 percent of the students enrolled in colleges of podiatry were women. However, both the number and proportion of women students are increasing. While only 3 percent of the fourth-year class in 1975-76 were women (15 students), nearly 8 percent of the first-year class (41 students) were women.

Total minority enrollment in the 1975-76 academic year was 125 students or 6 percent of all students enrolled in that year. Blacks accounted for the largest number of minority students enrolled (58 students), followed by Orientals (46 students). There were 25 minority students in the fourth year class and 25 in the first year class, accounting for 5 percent and 7 percent of total enrollment in those respective classes.

Educational Developments in Podiatric Medicine

All of the Nation's schools of podiatric medicine are freestanding institutions which rely heavily on Federal funds and tuition for support. Lack of financial operating stability is, thus a current major concern confronting the profession in the face of possible reduced Federal support. It has also led to a major attempt to affiliate the schools with academic health centers where additional educational, administrative, and financial support may be obtained. In general, the freestanding status of the schools has been a constraint which has limited institutional stabilization and further educational progress.

Although facing some financial pressures, the podiatric profession has implemented many changes to improve educational programs:

1. All schools are or soon will be in new educational facilities (by 1978) to accommodate the significantly increased enrollments attained since the early 1960's.

2. The clinical curricula in general medicine has been broadened in the belief that the podiatrist should become involved in the evaluation of the patient as a totality as well as the need to recognize systemic diseases as they relate to the lower extremities.

3. The number of full-time Ph.D. basic scientists and faculty members has increased substantially.

4. There is a major trend noted in increased clinical training in settings external to the main out-patient podiatric clinic of the school. As the result of recognition by the Joint Commission on Accreditation of

Hospitals, it can be expected that in years to come, more and more podiatric medical education will take place in hospitals as opposed to freestanding podiatric clinics.

5. Current educational experiences are being directed to developing and strengthening affiliations with other health sciences. A frequent setting for such interdisciplinary programs has been community or institutional-based clincial programs.

6. The number of electives has increased slightly in the more traditional lock-step podiatric curriculum, i.e., gait analysis, sports medicine, and advanced physiology.

7. Residency (internship) programs have increased dramatically, utilizing a centralized application service. Demand for these programs, however, continues to out-pace the ability of the profession to provide these positions as graduates seek more indepth experience in orthopedics, pathology, radiology, emergency care, physical medicine, rehabilitation and primary care aspects of foot health care. Second and third year residencies in podiatric surgery are available on a very limited basis, and certification by the National Board of Podiatric Surgery in this specialty in now available.

8. A combination of responsiveness to community needs and the necessity for additional clinical resources for podiatric medical students has contributed to the evolution of community practice clinical preceptorships in the offices of podiatrists for one to two months assignments.

The American Association of Colleges of Podiatric Medicine has also made some changes in national educational policy. Beginning with the 1978 entering class, all applicants to podiatric medical college must complete a new Medical College Admissions Test (MCAT), and three years of pre-professional college education will be the minimum requirement for entrance into the schools.

Projection of the Supply of Podiatrists to 1990

The supply of podiatrists is expected to rise sharply in the coming years. Several projections of the supply of active podiatrists to 1990 are presented here under different assumptions as to the number of graduate additions to supply over the projection period. 1/ The basic determinant of the future supply of podiatrists is very clearly the enrollment in podiatry schools. As indicated earlier, podiatry enrollments have grown rapidly since the early 1960's, with new

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1/ See Appendix A-VIII-6 for description of Methodology.

Federal legislation, beginning with the Health Professions Educational Assistance Act of 1963, providing much of the impetus for the recent increases. In estimating the total future supply of podiatrists, therefore, several different assumptions were made as to expected number of graduates of podiatry schools.

The basic assumption utilized in developing the "basic" projections of podiatrists is that the schools will meet the requirements of PL 94-484, with each school increasing its first-year enrollment of full-time students for the 1978-79 academic year by 5 percent over the 1976-77 academic year (if the earlier enrollment was not more than 100), or by 2.5 percent or 5 students (whichever is greater), if such enrollment was more than 100. No additional growth in enrollment per school is assumed, so that first-year enrollments are thus maintained at the 1978-79 level through the projection period. The basic projection series also assumes that only one new school of podiatry will open during the 1975-90 period, probably in academic year 1981-82 with a projected first-year enrollment of 24.

This "basic" projection of the graduating classes of 1974-75 through 1989-90, results in a total gross graduate input of 8,951 for that period. Utilizing the basic graduate projection and estimates of losses to the profession, the supply of active podiatrists is projected to grow from 7,300 in 1975 to 8,700 in 1980 and to 12,500 in 1990. The number of active podiatrists is thus projected to rise 5,200 or 71 percent between 1975 and 1990, as compared with much smaller average annual increases between 1970 and 1975. The ratio of active podiatrists to population is projected to increase sharply to 5.1 per 100,000 population in 1990, as compared with 3.4 percent per 100,000 in 1975.

In an alternate low projection series, the assumption is made that the schools will meet the requirements of PL 94-484 by providing for the specified proportion of first year enrollment of full-time students to be comprised of residents of States in which there are no accredited schools of podiatry. On this basis, first year enrollments would be maintained at the 1976-77 levels throughout the projection period, with no new schools of podiatry assumed to open. A total gross graduate input of 8,619 is projected for this 15-year period, as compared with 8,951 in the basic projection. Overall, the low projection indicates a 66 percent increase in podiatrists, to 12,100 by 1990.

In high projection series, the assumption was made that increases would occur in full-time first-year enrollments beyond those required in the legislation and assumed in the basic projection series. Such increases, would not approach the growth levels taking place during and prior to the earlier legislation, but would still result in an annual increase of 1 percent per year per school beyond the basic series. In addition to the new school included in the basic series, it was assumed that a second new podiatry school would open in the South (the area with the lowest ratios of podiatrists to population) in the 1985-86 academic year, with a first year enrollment of 24. Under this high alternative projection, a total gross graduate input of 9,196 is projected, with the supply of active podiatrists increasing to 8,700 in 1980 and 12,700 in 1990. This would represent a 20 percent increase between 1970 and 1980 and a 74 percent increase over the 1975-90 period, only a slightly larger increase than in the "basic" projection. Under the low alternative, the supply of active podiatrists is projected to be 8,700 in 1980 and 12,100 in 1990, or a 23 percent increase during the 1970-80 period and a 66 percent gain during the 1975-90 period. The podiatrist to population ratio would thus be 4.9 podiatrists per 100,000 population in 1990, very similar to the ratio under the basic assumption (5.1 per 100,000) and the high assumption (5.2 per 100,000). All three estimates, however, result in substantial increases over the 1975 level.

The projection findings under each set of assumptions described above are summarized in Tables VIII-2 and VIII-3.

Patterns of Practice

Although physicians provide many foot care services, substantial differences in patterns of practice exist between podiatrists and physicians. Data show that podiatrists handle about nine times as many soft tissue complaints, and about three times as many static foot deformities, but only one-sixth as many foot injuries as do physicians.

About three-fourths of all foot related care in the United States is being provided by podiatrists. According to recent data, podiatrists had about 591,000 patient visits per week, or about 30 million annual as a group patient visits. By way of contrast, physicians were responsible for only slightly more than 9 million office visits involving the foot. Of these, general and family practitioners accounted for nearly 4 million office visits involving the foot, while orthopedic surgeons were responsible for nearly 3 million such visits. In 1974 there were 9,377 orthopedic surgeons and 52,345 general practitioners. Their distribution by census region differed somewhat from that for podiatrists.

The age-sex composition of patients who receive foot care from physicians is also markedly different from that of patients treated by podiatrists. Two-thirds of all podiatrists' patients are female; more than one third are over 65 years of age, and only one of 10 is under age 17. Physicians, in contrast, provide foot care to proportionately more younger and fewer older patients than do podiatrists. These differences in patient characteristics are largely attributable to the relatively greater involvement by orthopedic surgeons, in particular, in the treatment of injuries. Despite these differences, physicians do in fact treat the same types of foot conditions as do podiatrists--although not with the same degree of emphasis.

Productivity of podiatrists, defined as mean number of patient visits, is directly related to the age of the podiatrist, his form of employment, and his use of auxiliary personnel. 1/ As shown below, the productivity of podiatrists peaks between the ages of 35 and 44, and declines thereafter:

Age of Podiatrist	Average Productivity (Visits Per Week)
Under 35 years	90.2
35 - 44	104.0
45 - 54	92.5
55 - 64	73.7
65 and over	46.8
All ages combined	83.4

There are several possible reasons for this decline: (a) Older podiatrists devote a lesser number of hours per week to patient care, (b) A greater percentage of older podiatrists are to be found in solo practice--the least productive form of employment, and (c) Older podiatrists make relatively less use of auxiliary personnel.

Despite the relevance of age, older podiatrists who are salaried or involved in group or partnership arrangements are seen to be at least as productive as some of their younger colleagues in solo practice.

The productivity of salaried podiatrists is greater than that of podiatrists in other forms of practice except for those between 45 and 54 years old and those 65 and over. Overall, solo practitioners (of all ages) handle between 20 to 30 patient visits less per week than their counterparts in other forms of employment. This amounts to well over a thousand visits per year fewer--a sizable difference.

Auxiliary Utilization

An important determinant of the amount and type of care provided by podiatrists is the presence of auxiliaries. More than 5,100 or approximately 73 percent of all active podiatrists reported utilizing some office assistants, medical and non-medical in 1974. Nearly one-half of all podiatrists utilized one or more full time assistants in that year. About 44 percent (or 3,083) utilized one full-time assistant, nearly 13 percent utilized two assistants, and 11 percent employed three or more full-time assistants. As is generally true in

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1/ Greenberg, Leonard. A Proposed Demand-Productivity Model for the Designation of Podiatric Manpower Shortage Areas, Report prepared for DHEW, Health Resources Administration.

most health professions, the proportion of podiatrists utilizing assistants decreased as the age of the podiatrist increased. Whereas nine of every ten podiatrists under age 35 reported utilizing one or more full-time assistants in 1974, only four of ten podiatrists age 65 and older utilized one or more full-time assistants. A similar distribution by age occurs for those utilizing part-time assistants.

A far higher proportion--93 percent--of all active podiatrists primarily specializing in surgery employed office assistants than did podiatrists reporting general practice as their primary activity. Approximately 70 percent of general practitioner podiatrists utilized assistants in 1974. In general, it appears from the 1974 data that podiatrists utilizing office assistants on a full-time basis provide a wider variety of services than do podiatrists not utilizing office assistants. For example, nine out of ten podiatrists utilizing assistants offered physical therapy treatment, in contrast to six out of ten of those not utilizing assistants.

Utilization of podiatric assistants also is a major factor in differences in productivity of podiatrists in patient care. Podiatrists providing patient care who did not employ office assistants averaged slightly more than 47 patient visits a week (during the 1974 reference week), while podiatrists who did employ office assistants averaged 91 patient visits during the same week, nearly twice as many. Productivity was also related to the number of office assistants which the podiatrist employed. Podiatrists with one full-time assistant averaged 86 patient visits per week; those with two full-time assistants averaged 112 patient visits, and those with

Age of podiatrist	Average productivity (visits per week)			
	Self-employed			Salaried
	Solo	Group 1/	Partnership 2/	
All ages combined...	77.9	100.3	107.7	107.8
Under 35 years..............	78.5	102.0	106.3	117.0
35-44......................	98.1	120.0	121.8	128.8
45-54......................	89.3	106.2	117.6	97.8
55-64......................	71.1	65.9	93.6	95.5
65 and over................	45.5	59.7	62.8	52.6

1/ Includes at least one podiatrist conjointly working with at least one person in another health profession, who can independently treat patients for nonpodiatric ailments.

2/ Includes two or more podiatrists conjointly providing podiatric services only.

three or more assistants had 125 patient visits. Thus increased use of auxiliaries in the future could play a major role in meeting the rising demand for podiatric services.

Existing and Projected Manpower Levels

In order to relate the national and regional distribution of health care practitioners ordinarily involved in the treatment of the foot role specifically to foot care, it is helpful to talk in terms of a single measure--the number of full-time equivalent (FTE) foot care practitioners. To do this, the assumption was made that orthopedic surgeons devote, on the average, 20 percent of their practice to the foot and general practitioners 3 percent. Based on those assumptions (which are consistent with the utilization figures presented earlier), the National and regional numbers of FTE foot care practitioners are as shown in Table IX-5.

While it is extraordinarily difficult to determine exact levels of requirements for podiatrists and others providing foot care services, most measures of future requirements indicate that the projected supply of podiatrists will fall far short of the number required, even if the care provided by orthopedic surgeons and general practitioners is included. As indicated, in 1990, the most likely level of supply of podiatrists is expected to be 12,500. If full-time equivalent general practitioners and orthopedic surgeons are included, approximately 5,000 additional foot care practitioners would be added to this supply. In total, then, a supply of about 17,500 foot care practitioners is expected to be available in 1990.

One measure of future requirements for podiatrists that is often used is the optimum ratio of 10 podiatrists per 100,000 population utilized by the American Podiatry Association. This results in a requirement for about 24,400 podiatrists in 1990. Although part of this requirement will likely continue to be met by orthopaedists, general practitioners and other physicians, it appears likely that there will still be a serious shortfall in the supply of podiatrists. A rough comparison of foot care practitioner supply and requirements in 1990 shows a projected supply of 17,500 FTE foot care practitioners versus a projected requirement for 24,400 practitioners, a shortage of 7,000 foot care practitioners. Even to raise the ratio in the South--which currently has the lowest practitioner density of the four major geographic regions--to parity with the next lowest region, would necessitate an additional 620 full-time foot care practitioners.

The SOAR general model generates a doubling requirements for podiatrists in 1990 over current levels. These estimates do not take into account recent trends toward increased utilization of podiatric services by the population. On the basis, the projected requirements for podiatrist in 1990 is about 30 percent greater than the projected supply in that year.

Data and Analytical Needs

The 1974 NCHS survey of podiatrists is the source of the latest and most reliable available data on the podiatric manpower. For most purposes, this data base provides an adequate descriptive base for the profession, and a new survey is planned for 1978. While these data cover most of the immediate data and analytical needs on podiatrists, more current data on podiatrists may be needed particularly for work such as designation of health manpower shortage areas, specifically as related to small geographic areas. It would also be desirable to have another data point for trend analysis for data on podiatrists. In addition, further data collection is needed in two other areas. The collection of more comprehensive data on the use of podiatric services is needed. Such data would not only provide counts of podiatric auxiliaries but would likely help to delineate specific areas of podiatry where such auxiliaries are involved. In addition, a task analysis study similar to that conducted recently for pharmacists needs to be mounted for podiatrists. Such a study would provide valuable data on how podiatrists in various settings spend their time.

From a longer range standpoint, there is a strong need for an epidemiological study which would have as its goal a better understanding of the footcare services sought by and provided to the population. This would assist in the development of more adequate manpower goals than those currently possible. Such a study would be designed to yield estimates of regional manpower needs on a time-phased, priority basis, providing of a data base superior to that currently available.

Methodology and Assumptions Relating to Projection of Podiatrists

Estimates of the number of active podiatrists for 1975-90 were calculated utilizing the data from the NCHS survey of podiatrists as a base. It was assumed the base reflected a time period of December 31, 1974. Data on graduates of podiatry schools for 1975 and 1976 were obtained from school reports on FY 76 capitation grant applications; the American Association of Colleges of Podiatric Medicine provided estimates of first-year enrollments through 1976-77. Graduate projections to 1990 were compiled from the number of first-year students reported 4 years earlier, utilizing an attrition rate of 12 percent in both the basic methodology and the alternative supply projections in line with the most recent experience. Thus, 88 percent of entering podiatry students are projected to graduate 4 years later. If a different attrition rate were used, of course, the graduate component would change somewhat, but the overall impact on the total supply estimates would be minor. Under the basic methodology, for example, using a 10 percent attrition rate would result in about 200 additional graduates over the projection period whereas using a 15 percent attrition rate would result in about 300 fewer podiatric graduates.

Separation rates used in the basic methodology and in the alternative approaches were derived largely from age-specific death and retirement rates for while males developed by the National Center for Health Statistics 1/ and the Bureau of Labor Statistics. 2/

In comparing age-specific data from the Department of Labor showing male labor force participation rates with information on the proportion of podiatrists that are inactive (as obtained from the 1974 NCHS Survey), it was found that a lower proportion of podiatrists were inactive for all age groups 60 years of age and above. This suggests that podiatrists tend to retire at a later age than does the general male labor force. Given this finding, adjustment factors were developed to convert the published age-specific retirement rates for males in the labor force to a series which would better approximate the apparent podiatrist experience. The overall consequence of the utilization of "podiatrist-specific" retirement rates is that retirements over the 20-year period are reduced by approximately 15

1/ Death rates from abridged life tables, U.S., 1967-71, white male and white female rates (unpublished 5-year age groups).
2/ Retirement rates are for the general male and female labor force, 1970, as published in Bureau of Labor Statistics. Length of Working Life for Men and Women, 1970. Monthly Labor Review, pp. 31-35, February 1976.

percent, compared with the number estimated to retire if the unconverted male labor force rates were used.

Unlike retirement patterns, there is no evidence to suggest that podiatrists, on the average, live longer than persons in the general labor force. Therefore, age-specific mortality rates derived from those developed by the National Center for Health Statistics were simply applied to the podiatrist population. Age-specific separation rates, consequently, represented the sum of individually computed retirement and mortality rates.

Table VIII-1. Trend in number of active podiatrists and ratios to population by geographic region: 1970 and 1974

Region	Number of Active Podiatrists 1970	1974	Change 1970 to 1974 (percent)	Ratio Per 100,000 Population 1970	1974	Change 1970 to 1974 (percent)
Total U.S...	7,078 1/	7,085 1/	0.1	3.5	3.4	-2.8
Northeast.	2,992	2,877	-3.8	6.1	5.8	-4.9
North Central.	2,059	1,968	-4.4	3.6	3.4	-5.6
South.....	989	1,135	14.8	1.6	1.7	6.2
West......	1,038	1,105	6.5	3.0	3.0	0.0

1/ Excludes 35 podiatrists, active in podiatric-related activities, who do not provide patient care.

Source: 1970 and 1974 NCHS Surveys of Podiatrists, Podiatry Manpower Series 14, No. 11, HRA 74-1806, March 1974.

Table VIII-2. First year enrollments and graduates in podiatry schools under basic and alternative assumptions: actual 1971-72 through 1975-76, projected 1976-77 through 1989-90

Academic year	First-year enrollment			Graduates		
	Basic methodology	Alternative assumptions		Basic methodology	Alternative assumptions	
		Low	High		Low	High
1972-73......	478	478	478	-	-	-
1973-74......	548	548	548	-	-	-
1974-75......	561	561	561	352	352	352
1975-76......	642	642	642	421	421	421
1976-77......	650	550	650	483	483	483
1977-78......	660	650	660	494	494	494
1978-79......	675	650	675	566	566	566
1979-80......	675	650	682	573	573	573
1980-81......	675	650	689	581	573	581
1981-82......	699	650	720	595	573	595
1982-83......	699	650	727	595	573	601
1983-84......	699	650	734	595	573	607
1984-85......	699	650	742	616	573	634
1985-86......	699	650	749	616	573	640
1986-87......	699	650	781	616	573	647
1987-88......	699	650	789	616	573	654
1988-89......	699	650	797	616	573	660
1989-90......	-	-	-	616	573	688

Table VIII-3. Supply of active podiatrists and podiatrists/population ratios, using basic methodology and alternate assumptions: actual 1970 and 1975; projected 1980-90

Projection series	1970	1975	1980	1985	1990
	Number of active podiatrists				
Basic methodology...	7,100	7,300	8,700	10,500	12,500
Alternatives:					
Low................	7,100	7,300	8,700	10,400	12,100
High................	7,100	7,300	8,700	10,600	12,700
	Rate per 100,000 population				
Basic methodology...	3.5	3.4	3.9	4.5	5.1
Alternatives:					
Low................	3.5	3.4	3.9	4.4	4.9
High..............	3.5	3.4	3.9	4.5	5.2

Source: 1970 active podiatrists derived from data in Koch, Hugo K., and Phillips, Hazel, M. Podiatry Manpower--A General Profile, United States. 1970 DHEW Pub. No. 74-1805. 1975 podiatrists derived from 1974 NCHS Survey of Podiatrists published in the Monthly Vital Statistics Report Vol. 24, No. 7, Supplement, Oct. 24, 1975.

Population: U.S. Bureau of the Census, Current Population Reports, Series P-25, No. 601 (Series II). Total population as of July 1, includes armed forces overseas.

Table VIII-4. Nationwide and regional distribution of health care practitioners involved in providing foot care

Region	Podiatrists (non-govt., 1974)		Orthopaedic surgeons (non-federal, 1972)		General practitioners (non-federal, 1972)	
	Number	Per 100,000 population	Number	Per 100,000 population	Number	Per 100,000 population
Total United States...	6,965	3.3	9,377	4.5	52,345	25.1
Northeast.....................	2,845	5.7	2,520	5.1	12,379	24.9
North Central.................	1,942	3.4	2,047	3.6	14,369	25.0
South.........................	1,099	1.7	2,584	4.0	14,561	22.4
West..........................	1,079	3.0	2,226	6.2	11,036	30.6

Source: 1974 NCHS Survey of Podiatrists and American Medical Association: Distribution of Physicians in the United States, 1972.

Table VIII-5. Full-time equivalent foot care practitioners in the United States, nationwide and by region

Region	Number of FTE foot care practitioner	Number per 100,000 population
Total United States...	10,410	5.0
Northeast.....................	3,720	7.5
North Central.................	2,782	4.8
South.........................	2,053	3.1
West..........................	1,855	5.1

IX. VETERINARY MEDICINE

In December 1975 there were an estimated 31,100 active veterinarians in the United States. This is a sizeable increase from the 25,900 estimated active veterinarians in 1970. The number of veterinarians is projected to increase dramatically over the next decade with the largest portion of the increase expected to come from the establishment of new veterinary schools. In the 1976-77 academic year there were 21 accredited schools of veterinary medicine. This number may rise to 27 by the mid-1980's, contingent upon approval and funding for several proposed new schools.

In terms of specialty the largest increase in the supply of veterinarians has occurred in companion animal practice, where the number of practitioners increased from an estimated 11,300 in 1970 to 14,700 in 1975. The number of food animal practitioners, the next largest specialty, showed only a small increase, from 6,400 to 7,000 over the same period.

While Blacks and females remain underrepresented in the field, there has been a sharp increase in the enrollment of females in veterinary schools, with women comprising 28 percent of total enrollment in the 1976-77 academic year.

Although the supply of active veterinarians may exceed projected requirements by the late 1980's, there is a growing problem of specialty and geographic maldistribution, caused in a large part by the increasing preference among veterinarians for clinical companion animal practice.

Veterinarians and the Delivery of Care

The role of the veterinarian as a contributor to human health is wide ranging, but often little understood. A question frequently raised with regard to the activities of veterianarians relates to the extent to which these activities contribute to human health.

A recent study supported by the Bureau of Health Manpower outlined areas in which the activities of veterinarians contribute to human health goals. 1/ These include zoonoses prevention and control, food protection, environmental hazard prevention and control, comparative medical research, mental and emotional health, and emergency medical

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1/ University of Minnesota School of Public Health. "A Summary of a Description of the Responsibilities of Veterinarians as they Relate Directly to Human Health." BHM Contract No. 231-76-0202, June, 1976.

services to animals. It was concluded by the National Advisory Committee for this study that, "As a major health profession, veterinary medicine is an integral part of the human health delivery system with activities that are inextricably entwined in the protection and improvement of human health." The committee further stated that, "Assigning relative importance to members of the health team is futile, since the activities of all professionals, including veterinarians, are necessary to promote optimal human health."

Another question currently being raised is whether or not the veterinarian is the only one who can perform the service which he/she provides. In some areas of veterinary practice, such as companion animal surgery or rabies inoculation, a licensed veterinarian is required. Other areas, such as biomedical research, could, at least in theory, be performed by biochemists or microbiologists. (This is not to suggest that veterinarians engaged in research should be replaced by biochemists or microbiologists, but only to provide an awareness of possible substitutability.) The increased use of veterinary assistants and animal technicians could extend the amount of care provided by veterinarians. These questions need to be further researched and monitored.

Current Supply of Veterinarians

There were an estimated 31,100 active veterinarians in the United States in December 1975. This number is based on adjustments to the AVMA masterfile and recent conversations with officials of AVMA regarding the completeness of the file. It represents an increase of twenty percent over the estimated 25,900 active veterinarians in 1970.

Veterinarians are engaged in a wide range of professional activities, including treatment of companion animals, herd maintenance and disease control, regulatory and public health functions, research, and teaching. (See Table IX-1).

Among active veterinarians the largest proportion are engaged in companion animal practice, the area which has also had greatest increase, with the number engaged in this type of practice rising from an estimated 11,300 in 1970 1/ to 14,700 in 1975. The number of food animal practitioners showed only a slight increase over this period rising from 6,400 2/ to 7,000. Further evidence of the trend toward small animal practice can be found in a recent study of practice specialties of graduates of the University of Georgia School of

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1/ The Supply of Health Manpower: 1970 Profiles and Projections to 1990. DHEW Pub. No. (HRA) 75-38, December, 1974.

2/ Ibid.

Veterinary Medicine from 1950 to 1971. 1/ Over one-half of the graduates during that period were engaged primarily in small animal practice.

The growing preference for clinical companion animal practice and a corresponding declining interest in farm animal practice are matters of increasing concern. The factors which have encouraged the trend toward clinical companion animal practice were examined in a recently completed study. 2/ These include: (1) a more office-based practice setting, (2) less time spent in driving, and (3) a shorter workweek. Other factors which appear to contribute to the preference for companion animal practice include: a less hazardous work setting than for farm animal practitioners, a higher degree of professional recognition, and the ability to practice a more scientific form of medicine in the office setting.

In terms of efforts for increasing interest in farm animal practice among new graduates, emphasis on non-financial incentives may be more successful in attracting veterinarians to this area of practice. In the above-mentioned study "no statistically significant differences were found in either the anticipated or actual incomes of veterinary students and practicing veterinarians, respectively, when related to their specific practice type." This finding contradicts the widely-held belief that income is the main reason for preferring companion animal to farm animal practice.

Another significant factor affecting specialty preference is the relationship between size of childhood residence and type of practice. There is a greater likelihood of a preference for farm animal practice among students who grew up in a rural setting. This suggests that a policy of increasing places in veterinary schools offered to persons with a rural background could very well increase the number of graduates who enter (and remain in) farm animal practice.

Current health manpower legislation (P.L. 94-484) has addressed this problem of specialty maldistribution. The law states that "an application of a school of veterinary medicine for a grant under Section 770 shall contain or be supported by assurances satisfactory to the Secretary that the clinical training of the school shall emphasize predominately care to food-producing animals or to fibre-producing animals, or to both types of animals". This requirement may increase the number of new graduates who opt for farm

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1/ Crawford and Coulter. "A Comparison of Practice Fates of Male and Female Georgia Veterinary Medical Graduates, 1950-1973," Journal of Veterinary Medical Education, pp. 26-27, Spring, 1976.

2/ Snizek and Bryant. "Intraoccupational Veterinary Specialties: Career Trends and Contingencies Among Students and Practitioners." Journal of Veterinary Medical Education, Vol. 2, No. 2, Fall, 1975.

animal practice in future years, but there are no assurances that, even after a student has received a veterinary education which has emphasized farm animal practice, he may not elect to engage in clinical companion animal practice.

Practitioner Characteristics

Veterinarians as a group are relatively young. The median age among active veterinarians is 37.6. Over two-thirds of the active veterinarians are under age 45 (See Table IX-2). This relatively young median age can be expected to characterize the profession through 1990, as the number of graduates from veterinary schools is expected to rise sharply.

Current information on sex and race of veterinarians is not available on the AVMA masterfile. The 1970 Census of Population indicated that females accounted for 5 percent of the active veterinarians in the United States in 1970. Blacks were estimated to account for slightly less than 2 percent of the active supply. 1/ However, the percentage of females admitted to veterinary schools has risen sharply, from 9 percent in academic year 1968-69 to over 30 percent in 1976-77. 2/ This clearly indicates that women will comprise an increasing proportion of total veterinarians in years ahead.

Geographic Distribution

As would be expected the distribution of active veterinarians by region and State is highly uneven. The highest ratios of veterinarians per 100,000 human population are found in the West North Central region, with Iowa at 43.2 having the largest ratio. However, these ratios do not reflect the number of food animals which require veterinary service, and, therefore, are not fully indicative of maldistribution. A more accurate geographic picture can be obtained by comparing food animal practitioners in a given area with food animal populations. This is expressed in terms of "veterinary livestock units"--a weighted system based on the varying amount of care required for different kinds of food animals. This recently developed measure should provide more insight for future analysis of distribution.

The problems of geographic and specialty maldistribution among veterinarians are closely related. While a clearer picture of the

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1/ U.S. Bureau of the Census. United States Census of Population: 1970 Detailed Characteristics. United States Summary. Final Report DC (1)-D1. U.S. Government Printing Office, 1973.

2/ Journal of the American Veterinary Medical Association. Student Enrollment 1976-77; 170:486, March 1, 1977. Also prior annual reports.

problem will be obtained when the currently ongoing additional analysis has been completed, it can be generally stated that the area of greatest shortage is for farm animal practitioners in rural areas. Any efforts aimed at alleviating specialty maldistribution should also be helpful in reducing geographic maldistribution. These will be dealt with at length in the next report.

Licensure Requirements

Veterinarians are required to be licensed in all States and the District of Columbia. Preprofessional requirements are not specified in the law. However, graduation from a college of veterinary medicine is required. The American Veterinary Medicine Association (AVMA) is the recognized specialized accrediting agency. Some States accept AVMA accreditation while others leave the question of approval to the board of examiners.

Written examinations are required, and in 29 States an oral examination is an additional requirement. Most States have provisions for recognizing applicants from other States. also, many State licensing boards accept, in lieu of graduation from an accredited college, a certificate as issued by AVMA through the Educational Commission for Foreign Veterinary Graduates (ECFVG).

Veterinary Education

In the 1976-77 academic year, there were 21 accredited schools of veterinary medicine in the United States. Two of these schools, the University of Tennessee and the University of Florida, admitted their first classes of students in 1976-77. Three additional schools of veterinary medicine are scheduled to open in the next several years: Mississippi State University in 1978, Tufts University in Massachusetts in 1979, and Oregon State University in 1979. (This latter program will be in conjunction with the school of veterinary medicine at Washington State University.) Still in the planning stage are veterinary medical programs at Virginia Polytechnical Institute, North Carolina State University, and the University of Nebraska. It is projected that these schools will open in the early to mid-1980's. Assuming all of the above mentioned programs are implemented, the number of schools of veterinary medicine will have risen from 18 in 1970 to 21 in 1976, and to 27 by the mid-1980's.

Between the 1964-65 and 1976-77 academic years, first-year enrollments in schools of veterinary medicine have increased from 1,139 to 1,856, an increase of 63 percent (See Table A-IX-1). The number of graduates has increased by 83 percent, from 874 to 1,599 over the same period. Much of this increase can be attributed to federal support provided under the Veterinary Medical Education Act of 1966 and subsequent legislation.

Veterinary medical education, like the other health education disciplines, has been subjected to numerous external and internal forces ranging from closer public scrutiny of the cost effectiveness of the educational system to the student's demand for greater educational relevancy. This multitude of forces has had and will continue to have an impact upon the veterinary medical education curriculum, not only on its content but also on its form and the manner in which it is presented.

Content changes which are currently taking place deal largely with the streamlining of the traditional course material in order to open up time for the inclusion or expansion of new course material such as herd management, preventive medicine, public health, environmental health, and human health and nutrition. In addition, special courses are being developed and presented which are designed to reduce the student attrition rate particularly among minorities.

Numerous situations exist where the form of the curriculum is changing in tandem with the changes in content. In some instances, core and elective courses have been developed to allow the student greater flexability in pursuing his particular interests. A trend toward combining the basic science courses with the clinical courses is noted. This tends to focus the learning experience on all facets of organ systems rather than the multiplicity of disease entities. Often the student is allowed to use the animal of his choosing as his model in this system.

In order to encourage greater participation in community health, food animal practice and rural practice, an increasing amount of instruction is taking place "off campus" in functioning practices and field programs. This has the added benefit of demonstrating the relevance of the curriculum to the students.

One of the more dramatic changes currently taking place is the greater utilization of modern technology in the teaching process. A movement toward self-paced learning supported by strong autotutorial systems is in evidence. The development of learning resource centers is currently taking place at most of the schools of veterinary medicine. These centers are usually staffed by educational specialists and a variety of audio-visual personnel that were not, heretofore, available.

Television and computers are being brought into the educational process in ever increasing amounts leading to improved educational efficiency and effectiveness. As greater reliance is placed upon self-paced learning supported by computer-assisted instruction, the further development of these systems will be required.

Projection of First-Year Enrollment

The basic projection of first year enrollments through 1987-88, along with alternative low and high projections, is presented in Table IX-3. The 1976-77 academic year was used as a base year, with 21 schools and a total first-year enrollment of 1,856 students. Increases over the period have been broken down into three components: (1) increases mandated by PL 94-484, (2) new schools, and (3) autonomous growth. (A detailed analysis is presented in the appendix.)

Under the basic series, first-year enrollments are projected to increase to 2,209 in the 1980-81 academic year and to 2,578 in 1987-88. Under the low series, the projected enrollment is 2,165 in 1980-81 and 2,220 in 1987-88; under the high series 2,243 in 1980-81 and 2,811 in 1987-88.

Projection of the Future Supply of Veterinarians

Under the basic methodology--which is considered the most realistic projection--the supply of active veterinarians is projected to increase from 31,059 in 1975 to 54,900 in 1990, an increase of 77 percent. A difference of only 2,300 is projected between the high and low series. The projection model takes into account the age distribution of the base, projected first-year enrollments, the completion rate (first-year enrollments less the cohort attrition rate) in veterinary schools, and death and retirement rates for veterinarians. Three series of projections of the supply of active veterinarians through 1990 are presented in Table IX-4. For each series the respective basic, low, or high projection of first-year enrollments was used (See Table A-IX-2). The same rates of completion and death and retirement were used for each series.

This sizeable increase from previous projections of the supply of veterinarians is due largely to the opening and projected opening of new schools of veterinary medicine. The demand for admission to schools of veterinary medicine is strong, with an application-to-acceptance ratio of around six-to-one, which is approximately double that of medical schools. Thus there is great pressure on States without schools of veterinary medicine to establish veterinary programs to satisfy the demands of their residents.

Supply of Veterinarians vs Requirements

Estimates of requirements of veterinarians are best obtained by separate analysis of each area of veterinary practice--companion animal, food animal, meat inspection, teaching, research, and so on. The requirements for each specialty can then be combined to obtain an aggregate estimate of requirements. A projection of requirements through 1990 was made by the Manpower Analysis Branch in 1973, extending the earlier published projections of the National Academy of Sciences. 1/

A comparison of projected supply and requirements shows that a balance may occur in the late 1980's, when the supply may very well exceed requirements. The supply is projected to reach 54,900 in 1990, with an estimated requirement of 52,300 2/ for that year. From an overall viewpoint this suggests that if all of the proposed new schools are established and if there is an autonomous growth rate of 1 percent per year, then there may be an excess supply of veterinarians in 1990. However, additional work is needed to update and refine the projection of requirements, including more research on the utilization and productivity of veterinarians and auxiliaries in the various practice settings in which they are engaged.

Data and Analytical Needs

The master file of the American Veterinary Medical Association represents the latest available data on veterinarians in the U.S. Although the file was judged to be only about 80 percent complete in 1973, the rate of completeness is believed somewhat higher at present due to improvements implemented by the Association following a study supported by BHM.

Being dependent on an essentially incomplete data base in order to generate estimates of veterinarians, a complete inventory of all veterinarians is needed, possibly through the licensure process.

A prime difficulty in utilizing the licensure process as a mechanism for gathering data on veterinarians is that it appears that a substantial portion of active veterinarians may not maintain an active State license. Therefore to gather national data on veterinarians it may be necessary to supplement data collected through the licensure renewal process with a survey of veterinarian employers such as the U.S. Dept. of Agriculture as the employer of veterinarians acting as Federal meat inspectors.

Veterinary medicine is one of the 13 occupations included in the Cooperative Health Statistics System (CHSS) under the aegis of the National Center for Health Statistics. At this time about 20 States are actively collecting data on veterinarians under CHSS. The desirability of gathering comparable information in non-CHSS States has been discussed by the Bureau of Health Manpower. It is likely

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1/ Committee on Veterinary Medical Research in Education. New Horizons for Veterinary Medicine. National Academy of Sciences, Washington, D.C., 1972.

2/ Unpublished estimate of veterinarian requirements made by the Manpower Analysis Branch in 1973.

that data for veterinarians practicing in non-CHSS States will be collected by NCHS with BHM support during the next two fiscal years. However, as mentioned above, additional data collection efforts will be necessary to obtain a complete census of practitioners.

While the immediate data and analytical needs on veterinarians are somewhat more critical than for other health manpower disciplines, it would be desirable to gather additional information on veterinarian productivity, auxiliary utilization or other critical issues comparable to other health professions.

Methodology and Assumptions Relating to Projections of Veterinarians

Basic, low and high projections of first-year enrollments in schools of veterinary medicine are presented in Table A-IX-2.

The 1976-77 academic year was used as a base year, with 21 schools and a total first-year enrollment of 1,856 students. The future growth in first-year enrollments has been broken down into the following components: (1) increases mandated by Public Law 94-484, (2) new schools, and (3) autonomous growth. Over the projection period of 1977-78 to 1987-88, the only legislative intervention is assumed to be PL 94-484. The anticipated effect of this law is included in the low, basic, and high projection series.

(1) Increases mandated by Public Law 94-484: This legislation requires schools of veterinary medicine to increase enrollments in the 78-79 academic year by at least 5 percent, or have 30 percent of the enrollment of full-time first-year students be residents of States in which there are no accredited schools of veterinary medicine. An analysis of the geographic distribution of the 1976-77 entering class of veterinary students shows that 8 of the 21 schools presently meet the 30 percent criteria and would be required only to maintain the present number of first-year places. It has been assumed that these 8 schools will maintain enrollments at the 1976-77 level through the 1978-79 academic year, and that the remaining schools will opt for the 5 percent increase, and not assign places to out-of-State students.

(2) New Schools: Three new veterinary medical programs, at Mississippi State, Tufts, and Oregon State University are relatively certain of being implemented and have been included in the low, basic and high projection series. Two proposed programs, at Virginia Polytechnic Institute and North Carolina State University, have been included in the basic and high series. The proposed school for the Old West Region, at the University of Nebraska, has been included in the high series, since its establishment appears less than certain at this time. Also included in the low, basic, and high series is an increase in enrollment at the University of California which is projected

for 1979-80. The increase, estimated at 40, may be in the form of a new branch or an expansion of the facilities at Davis. Although the exact date of the increase is uncertain, there is considerable pressure on the State to increase its output of veterinarians to meet the demand for veterinarians within the State.

(3) Autonomous Growth: For the low projection series, autonomous growth is assumed to be zero, with existing schools maintaining enrollments at 1978-79 levels (except for the University of California). While this is undeniably a highly conservative assumption, it provides a minimum likely forecast. For the basic series, autonomous growth is estimated at one percent, beginning with the 1979-80 academic year. This approximates the anticipated annual increase in population in the United States (0.86 percent) in 1975 through 1990. 1/ An autonomous annual growth rate of 1.8 percent is used in the high series. This is the rate of growth in first-year enrollments during the 13-year period prior to enactment of the Veterinary Medical Education Act of 1966. This rate, previously used as a basic assumption in the projections made by this Bureau in 1974, seems appropriate for the high series at this time, since there has been a sizeable increase in the number of schools since the previous projections were made and more new schools are anticipated. The establishment of these new schools should reduce some of the expansion pressures on existing schools. A number of States without schools of veterinary medicine have arrangements whereby neighboring States with veterinary schools will accept a certain number of students each year. As some of these States establish their own veterinary programs, the schools which previously accepted the students from neighboring States will have more first-year spaces available for their own residents.

1/ Bureau of the Census. Population Projections, 1975-1990.

Table IX-1. Number of active veterinarians, by major professional activity: December, 1975

Major professional activity	Number of active veterinarians	Percent distribution
All activities..........	31,059	100.0
Companion animal practice......	14,691	47.3
Food animal practice............	6,966	22.4
Equine practice.................	866	2.8
Regulatory veterinary medicine.	3,400 1/	11.0
Military veterinary medicine...	800	2.6
Veterinary public health.......	385	1.2
Lab animal medicine............	419	1.3
Clinical practice..............	302	1.0
Teaching/research..............	2,259	7.3
Other..........................	971	3.1

1/ Includes approximately 2,000 meat and poultry inspectors employed by U.S. Dept. of Agriculture.

Source: Based on data from the American Veterinary Medical Association.

Table IX-2. Age distribution of active veterinarians: December, 1975

Age group	Number of active veterinarians	Percent distribution
All ages..................	31,100	100.0
Less than 25 years..............	1,394	4.5
25-44 years....................	20,156	64.9
25-29........................	6,691	21.5
30-34........................	5,231	16.9
35-39........................	4,265	13.7
40-44........................	3,969	12.8
45-64 years..................	9,235	29.7
45-49........................	3,635	11.7
50-54........................	1,950	6.3
55-59........................	2,494	8.0
60-64........................	1,156	3.7
65 years and over............	274	0.9
65-69........................	208	0.7
70 and over..................	66	0.2

Source: Number of active veterinarians based on data from the American Veterinary Medical Association.

Table IX-3. First-year enrollments and graduates in veterinary schools, under basic and alternative assumptions: actual 1976-77, projected 1977-78 through 1989-90

Academic year	First-year enrollment			Graduates		
	Basic methodology	Alternative assumptions		Basic methodology	Alternative assumptions	
		Low	High		Low	High
1976-77......	1856	1856	1856	1529	1529	1529
1977-78......	1936	1936	1936	1630	1630	1630
1978-79......	2025	2025	2025	1653	1653	1653
1979-80......	2160	2138	2177	1804	1804	1804
1980-81......	2209	2165	2243	1886	1886	1886
1981-82......	2296	2190	2347	1976	1976	1976
1982-83......	2403	2220	2471	2112	2091	2129
1983-84......	2465	2220	2550	2165	2122	2198
1984-85......	2512	2220	2654	2250	2146	2300
1985-86......	2534	2220	2708	2355	2176	2422
1986-87......	2556	2220	2772	2416	2176	2495
1987-88......	2578	2220	2811	2462	2176	2601
1988-89......	--	--	--	2483	2176	2654
1989-90......	--	--	--	2505	2176	2717

Source: 1976-77 first-year enrollments, Journal of American Veterinary Medical Association.

Table IX-4. Supply of active veterinarians and veterinarian/population ratios, using basic methodology and alternative assumptions: actual 1960-75; projected 1980-90

Projection series	1960	1970	1975	1980	1985	1990
	Number of active veterinarians					
Basic methodology...	19,700	25,900	31,100	37,500	45,600	54,900
Alternatives:						
Low................	19,700	25,900	31,100	37,500	45,400	53,400
High...............	19,700	25,900	31,100	37,500	45,700	55,700
	Rate per 100,000 population					
Basic methodology...	10.9	12.6	14.6	16.8	19.5	22.4
Alternatives:						
Low................	10.9	12.6	14.6	16.8	19.4	21.8
High...............	10.9	12.6	14.6	16.8	19.5	22.7

Source: 1960, 1970, and 1975 active veterinarians: Based on data from the American Veterinary Medical Association. Population: U.S. Bureau of the Census. Current Population Reports. Series P-25, No. 601 (Series II). Total population as of July 1, includes armed forces overseas.

X. MEETING THE DATA AND ANALYTICAL NEEDS FOR PL 94-484

As indicated in earlier sections of this report, much of the data, information, and analyses needed to address more properly many of the current critical issues relating to the status of the health professions are either unavailable or out-dated. Limited efforts have been undertaken in recent years to collect the needed data and to perform the necessary analyses. Because of the health care system's magnitude, complexity and importance, resolution of critical health manpower issues requires a much expanded information and analytical base.

In full recognition of this, Section 708 of the PHS Act as amended by PL 94-484 requires the Secretary of Health, Education, and Welfare to "...establish a program including a uniform health professions data reporting system to collect, compile, and analyze data on health professions personnel" and to "...develop analytic and descriptive studies of the health professions, including evaluations and projections of the supply of, and requirements for, the health professions by specialty and geographic location". It is believed that the impetus provided by this requirement will ultimately aid significantly in expanding the data and analytical activities needed to provide the President and Congress with a stronger information base for development of policies and legislation.

Authority for implementation of Section 708 of the law has been assigned jointly to the National Center for Health Statistics and the Bureau of Health Manpower. The National Center for Health Statistics has the responsibility for establishment of the uniform health professions data reporting system and the Bureau of Health Manpower for the analytic and descriptive studies. Although the time since passage of the law has been too brief to permit any definitive results to be obtained from new surveys and studies, plans have been jointly developed by NCHS and BHM for carrying forward these important activities.

The purpose of this Chapter is to provide a general overview of the plans which have been developed jointly by the Bureau of Health Manpower and the National Center for Health Statistics in response to the directive in the law, including (1) a description of the procedures to be followed in the implementation of the health professions data reporting system, both in the immediate future and over the long run, and (2) a summary of the major analytic and descriptive studies that are planned to be undertaken during the next several years. Findings from these inventories and studies will be incorporated in future reports to the President and Congress.

The Uniform Health Professions Data Reporting System

The uniform health professions data reporting system is being developed by the National Center for Health Statistics through the Cooperative Health Statistics System (CHSS). In 1971, under the provisions of PL 91-515, NCHS began the development of the CHSS as a mechanism for the provision of needed health statistics through a coalition of Federal, State, and local agencies. Public Law 93-353, the Health Services Research, Health Statistics, and Medical Libraries Act of 1974, strengthened the mandate to design and implement a system for producing comparable and uniform health information and statistics at the various levels of government. The National Center for Health Statistics has the responsibility for coordinating the efforts among Federal agencies and between the Federal government and the States to assure the quality and comparability of the data collected and to provide to the States the Federal share of costs for developing and operating statistical systems.

Together, the health manpower and health facility components of the CHSS represent the mechanism through which the uniform health professions data reporting system is being developed. The health manpower component consists of complete inventories in each CHSS State, approximately one-half of all States, for selected licensed health occupations, currently including allopathic physicians, osteopathic physicians, dentists, dental hygienists, registered nurses, licensed practical nurses, pharmacists, chiropractors, veterinarians, physical therapists, optometrists, podiatrists, and nursing home administrators. Studies are currently being made of the feasibility of including additional health occupations (psychologists, medical technologists, audiologists, speech pathologists, and public health personnel) in the future. The inventories provide data on training, licensure status, place of practice, professional specialty, practice characteristics, and selected demographic and socio-economic characteristics of health professions personnel.

Earlier plans called for the CHSS to be fully operational in all States by the early 1980's, and currently about 25 States are already developing or implementing health manpower or facilities components. If current NCHS plans materialize, aided by the impetus of PL 94-484, and necessary budget and staff are provided, it is anticipated that the health manpower and facilities components of the CHSS will be operational several years sooner, perhaps within the next few years.

Because of the time needed to complete the CHSS in all States and thereby to fully implement the data system called for by the law, it has become necessary to develop an interim plan for the provision of the required national data. This interim plan, developed jointly by the Bureau of Health Manpower and the National Center for Health Statistics, calls for immediate but phased data collection in those States that currently are not participants in the CHSS. The information which is collected and the procedures which are followed are identical to those in the CHSS States. Consequently, the resultant data, when combined with data from the CHSS States, will provide general purpose national statistics for selected health occupations. Supplementary inventories have been completed or are underway for registered nurses, optometrists, and pharmacists.

Over the next several years, plans call for surveys in the non-CHSS States to collect general purpose statistics on allopathic physicians, osteopathic physicians, dentists, podiatrists, veterinarians, licensed practical nurses and dental hygienists, among others. Like the CHSS, these surveys would collect information on such items as personal characteristics, educational background, professional activity, specialty, practice setting, and location.

In FY 1978, top priority will be given to surveys of allopathic and osteopathic physicians and licensed practical nurses. In FY 1979, the cycle of the health professions surveys will be completed with surveys of podiatrists and veterinarians. Upon completion of these efforts, the CHSS will hopefully be completed and no further interim surveys will be necessary.

In addition to the surveys of licensed health professionals, similar interim surveys of facilities will provide data on the non-licensed manpower in a number of health care delivery system settings, such as nursing homes, hospitals, and group practices and clinics. Here, too, the information to be collected would be the same as that collected in the CHSS.

Even when these interim manpower and facility surveys are completed and the data combined with information flowing from the CHSS, however, the uniform health professions data reporting system for all the health manpower types mentioned in Section 708 will not be completed. This reflects the fact that a number of the disciplines mentioned in the Section are not licensed in all 50 States and are not part of the manpower component of the CHSS. The disciplines include health care administration personnel, audiologists, and speech pathologists.

Plans call for NCHS to conduct methodological research on how best to collect data on these groups and then to move into a collection effort shortly thereafter. Upon completion of these three discrete but related efforts, a continuous flow of health professions data will be forthcoming and the requirements of Section 708 for a uniform health professions data reporting system will be a reality.

As indicated earlier and as recognized clearly in PL 94-484, there is also a critical need for analytical and descriptive studies of the health professions, studies that go well beyond collection of new and additional information. Although the availability, currency, and validity of the data on health practitioners, such as that to be obtained from the health professions annual reporting system, is of critical importance, of equal importance to the process of reporting on the current and future status of health professions is the analysis of these and other data. Plans are being made to expand significantly the scope of analytical and descriptive studies in order to obtain better insights into the workings of the health care system and the dynamics of health manpower developments.

The plan developed by the Bureau will address particularly those manpower issues that are of significance to policy and legislative activities. The plan essentially calls for the development of a number of analytical studies of the health care, health manpower and health education systems in the United States to obtain an improved understanding of the strengths, weaknesses and dynamics of these systems, past, present and future. In simple terms, the objective is to be able to provide to Congress and the President relevant information on manpower constraints upon the provision of health care in the U.S. currently and in the future.

Overall, the art and science of collection of data and statistics described in the earlier section of this chapter are far advanced over the state-of-the-art in the area of health analysis. The health care and health manpower issues confronting the Nation require answers to a multitude of discrete, complex, and inter-related questions. As a result, the plan developed for conduct of analytical studies calls for studies on a large, diverse and wide ranging set of topics, which will only be touched on here. Other chapters of this Report describe in more detail some of the studies underway, needed, or planned.

The Bureau of Health Manpower has identified more than 30 specific analytical studies and efforts that would have to be mounted to properly address the requirements of Section 708. However, these activities are being or will be undertaken to address health professions issues and requirements described not only in Section 708 of the PHS Act for the purpose of improving the information base for the Report to Congress and the President on the status of health professions personnel, but also to provide analytical support for other sections of the law as amended by PL 94-484. These include the analyses needed for sections relating to the designation of health manpower shortage areas, the report on allied health personnel, the report on public health and community health personnel, and other sections of the Law.

One major set of information activities will be mounted to provide baseline current information on students in health professions schools. In some cases, cooperative arrangements will be developed with educational institutions and school associations to collect and/or provide the data, while in other cases the information will be obtained from schools or individuals receiving financial support from the Bureau of Health Manpower, especially under Section 770 of the legislation, which provides for annual grants to schools of medicine, osteopathy, dentistry, public health, veterinary medicine, optometry, pharmacy, podiatry for the support of the education programs. Plans for development of this information are not firm as yet, and will be provided in the next Report.

Reflecting the extraordinarily complex issues facing the health care system and the critical importance of addressing these topics, the Bureau of Health Manpower's program calls for manpower studies related to utilization, education and practice characteristics, productivity, practice behavior, and determinants of location choice. In the health education arena, studies are planned on student financing, operation of health professions institutions, characteristics of faculty, students and graduates, and curriculum developments. Although these activities often include some data collection, their primary thrust will be analytical in nature. An important aspect of this analytical program will be the development of "models" and analytical procedures to describe the operation of the current health manpower system and to forecast the possible directions that system may take in the future. Especially important will be the development of studies to forecast requirements, supply, and geographic distribution of health manpower. Some of the types of analytical studies planned are listed below.

1. Studies to support improvement of requirement models and the estimation of current requirements. These general models would be used to forecast future manpower requirements considering health insurance, the price of care, delivery system changes such as HMO's and mid-level practitioners, and other developments in health manpower.

2. Studies to support improvement of supply models and to evaluate more reliably the changes and dynamics occurring among the current supply of health manpower. These models would help to forecast the future supply of manpower considering minority and sex composition, impacts of foreign graduates shifts in composition of graduate medical education, policy developments and other changes affecting manpower.

3. Studies to support analysis of manpower maldistribution and development of better identification of areas in need of health manpower. This program would investigate measures of manpower shortage and its causation and forecast future trends in the health manpower distribution to support improved policies aimed at resolving the health manpower maldistribution.

4. Analysis of graduate medical education and training developments. Such studies would support analytical efforts to understand the determinants of current supply and distribution of medical specialty manpower and to forecast the future situation.

5. Studies of the practice patterns of physicians already in practice. These studies would provide for an examination of practitioners' diagnoses and treatment patterns for specific categories of illnesses, length of encounters with patients, and characteristics and classification of illnesses.

6. Analysis of the relationship between practice setting and cost effectiveness of the provision of health care services. This analysis would take into account setting costs and utilization of manpower.

7. Task analysis of health practitioner activities. These studies would help to improve modelling capability in order to better estimate current and future physician specialty requirements and to help assess productivity changes among physicians arising from task delegation and the substitutability of different manpower groups.

8. Studies of the place of practice, specialty and practice characteristics of different health manpower types. These projects would develop methods to assess the relationship between manpower requirements, quality of care, and consumer behavior.

The above are only a few of the types of studies planned by the Bureau of Health Manpower to respond to the directives in Section 708 of the PHS Act as amended by PL 94-484. Although funding to support all of these studies is not available, the Bureau plans to conduct these activities on a phased priority basis as resources permit, with top priority given to those whose results will be most significant for the next Report to the President and Congress, such as refined projections of the requirements for physicians and dentists, projections of the supply of minorities and women in the health professions, and improved estimates of the impact of graduate medical education changes on specialty distribution. That second annual Report will also describe in more detail the progress in attaining the data and analytical goals set by the legislation.

APPENDIX A

Detailed Tables

Table A-II-1. Number of health practitioners short and shortage areas by State and discipline 1/

State	M.D./D.O.		Dentistry		Optometry		Pharmacy		Podiatry		Vet. Med.	
	# prac	# areas	# prac	# areas	# prac	# areas	# prac	# areas	# prac	# areas	# prac	# areas
U.S. Total	10261	2107	5053	1639	1524	848	333	205	2750	1487	966	501
Alabama	506	55	231	56	56	40	6	3	114	7	13	12
Alaska	42	21	18	15	4	4	8	7	7	4	2	2
Arizona	40	22	33	17	9	6	-	-	16	11	1	1
Arkansas	258	54	106	42	21	21	-	-	63	44	19	17
California	104	55	10	4	4	4	3	2	65	33	-	-
Colorado	46	17	15	20	15	14	1	1	32	14	1	1
Connecticut	92	33	3	2	1	1	-	-	3	1	6	2
Delaware	14	3	13	2	-	-	-	-	4	2	-	-
Dist. of Columbia	87	5	27	3	-	-	-	-	-	-	31	7
Florida	93	26	125	33	25	24	4	5	97	42	8	9
Georgia	654	126	435	136	101	65	5	3	111	76	22	20
Hawaii	3	2	-	-	2	2	3	1	26	4	-	-
Idaho	68	21	25	20	5	5	-	-	10	10	3	3
Illinois	258	62	59	26	12	12	18	11	49	36	1	1
Indiana	296	55	130	45	10	10	42	23	74	53	3	2
Iowa	157	49	50	26	12	12	2	2	44	41	44	44
Kansas	170	74	63	51	30	19	-	-	38	27	-	-
Kentucky	418	87	244	84	51	46	9	14	63	53	42	28
Louisiana	355	49	161	48	34	28	17	7	116	57	26	20
Maine	11	5	51	12	1	1	-	-	19	9	7	4
Maryland	156	12	136	14	62	14	7	2	30	15	15	5
Massachusetts	-	-	-	-	-	-	-	-	-	-	-	-
Michigan	195	34	84	21	21	13	8	3	79	44	21	9
Minnesota	256	55	21	10	9	8	5	1	120	45	3	3
Mississippi	312	66	199	89	52	47	5	3	83	64	26	23
Missouri	355	70	190	67	15	13	28	22	85	47	9	7
Montana	58	34	17	17	9	9	2	2	7	7	1	1
Nebraska	116	52	48	24	27	20	4	4	11	9	-	-
Nevada	18	12	10	9	2	5	1	1	9	2	-	-
New Hampshire	2	1	4	4	4	4	1	1	11	9	-	-
New Jersey	-	-	15	3	3	2	-	-	22	6	-	-
New Mexico	98	19	84	23	7	6	2	2	18	15	5	3
New York	487	21	28	7	19	9	-	-	42	24	175	6
North Carolina	926	256	471	143	76	56	40	20	152	78	86	65
North Dakota	78	35	31	22	6	6	1	1	-	3	7	5
Ohio	277	36	182	42	19	6	-	-	42	30	18	7
Oklahoma	243	48	89	36	4	4	-	-	45	34	4	4
Oregon	20	8	6	3	1	1	-	-	56	23	3	3
Pennsylvania	165	25	18	9	10	9	9	3	28	19	61	17
Rhode Island	70	4	21	3	3	3	-	-	2	2	11	3
South Carolina	276	43	198	39	26	18	5	1	101	42	15	13
South Dakota	110	48	42	33	7	7	7	5	9	7	7	6
Tennessee	378	75	140	65	35	37	12	7	118	68	25	22
Texas	719	156	401	133	110	83	-	-	228	113	19	15

Table A-II-1. Number of health practitioners short and shortage areas by State and discipline 1/ (cont)

State	M.D./D.O.		Dentistry		Optometry		Pharmacy		Podiatry		Vet. Med.	
	# prac	# areas	# prac	# areas	# prac	# areas	# prac	# areas	# prac	# areas	# prac	# areas
Utah................	62	13	9	7	1	2	-	-	11	8	1	2
Vermont.............	33	20	10	6	1	1	4	3	5	5	-	-
Virginia............	205	47	208	52	81	41	32	21	147	56	54	9
Washington..........	61	17	9	8	2	2	-	-	50	21	-	-
West Virginia.......	149	33	99	33	13	12	23	10	38	30	44	28
Wisconsin...........	176	47	8	7	1	1	5	3	53	44	4	4
Wyoming.............	12	12	2	4	2	3	-	-	7	7	-	-
Puerto Rico.........	543	63	475	74	167	74	-	-	181	66	105	60
Virgin Islands......	14	3	9	3	-	-	-	-	-	-	-	-

1/ As of March 25, 1977.

Table A-II-2. Number of shortage area educational loan repayment applications and aggreements by discipline and program processed by the Student Assistance Staff from June 1, 1973 to June 30, 1977

Program/discipline	Applications				Agreements	
	Received	Ineligible	Pending applicant information	In fiscal administration	Sent out	Signed
Total all programs....	6,478	1,398	322	678	4,080	3,978
Total......................	3,239	699	161	339	2,040	1,985
Physicians (M.D. and D.O.).	1,072	181	75	108	708	693
Dentists..................	1,004	173	41	124	666	642
Optometrists..............	151	33	4	15	99	97
Podiatrists...............	341	33	12	45	251	249
Veterinarians.............	275	77	11	15	172	167
Pharmacists...............	147	44	4	11	88	86
Nurses....................	249	158	14	21	56	51
Non-Federal programs.........	2,214	560	118	228	1,308	1,271
Physicians (M.D. and D.O.).	431	98	48	48	237	231
Dentists..................	753	134	33	93	493	474
Optometrists..............	136	31	4	13	88	86
Podiatrists...............	340	33	12	45	250	248
Veterinarians.............	274	77	11	14	172	167
Pharmacists...............	71	38	-	3	30	29
Nurses....................	209	149	10	12	38	36
National Health Service Corps..............	568	65	28	47	428	421
Physicians (M.D. and D.O.).	439	46	20	33	340	337
Dentists..................	108	14	4	14	76	73
Pharmacists...............	4	-	1	-	3	3
Optometrists..............	1	-	-	-	1	1
Podiatrists...............	1	-	-	-	1	1
Nurses....................	15	5	3	-	428	421
Indian Health Service.........	457	74	15	64	304	293
Physicians (M.D. and D.O.).	202	37	7	27	131	125
Dentists..................	143	25	4	17	97	95
Pharmacists...............	72	6	3	8	55	54
Optometrists..............	14	2	-	2	10	10
Veterinarians.............	1	-	-	1	-	-
Nurses....................	25	4	1	9	11	9

Table A-II-2. Number of shortage area educational loan repayment applications and aggreements by discipline and program processed by the Student Assistance Staff from June 1, 1973 to June 30, 1977 (cont)

Fiscal year	Applications				Agreements	
	Received	Ineligible	Pending applicant information	In fiscal administration	Sent out	Signed
Total all programs....	6,478	1,398	322	678	4,080	3,970
Total......................	3,239	699	161	339	2,040	1,985
1974......................	515	86	-	-	429	429
1975......................	955	227	-	-	728	728
1976......................	1,006	262	7	31	706	695
T.G......................	291	60	15	80	136	106
1977......................	472	64	139	228	41	27
Non-Federal programs..........	2,214	560	118	228	1,398	1,271
1974......................	255	63	-	-	192	192
1975......................	658	183	-	-	475	475
1976......................	726	206	-	8	512	504
T.G......................	208	47	13	50	98	78
1977......................	367	61	105	170	31	22
National Health Service Corps..............	568	65	28	47	428	421
1974......................	221	16	-	-	205	205
1975......................	112	11	-	-	101	101
1976......................	147	31	7	12	97	96
T.Q......................	42	6	2	14	20	16
1977......................	46	1	19	21	428	421
Indian Health Service........	457	74	15	64	304	293
1974......................	39	7	-	-	32	32
1975......................	185	33	-	-	152	152
1976......................	133	25	-	11	97	95
T.G......................	41	7	-	16	18	12
1977......................	59	2	15	37	5	2

Table A-IV-1. Trend in number of active physicians (M.D.), by specialty: 1963-76

Specialty	1963	1964	1965	1966	1967	1968	1969
Total active M.D.'s 1/............	261,728	269,552	277,575	285,857	294,072	296,312	302,966
Primary care............................	110,071	111,573	113,090	114,157	115,581	116,760	114,275
General practice 2/....................	66,875	65,861	64,943	63,903	62,717	61,578	58,919
Internal medicine......................	30,434	32,230	33,892	35,315	37,077	38,532	38,258
Pediatrics...............................	12,762	13,482	14,255	14,939	15,787	16,650	17,098
Other medical specialties...............	12,291	12,753	13,288	14,045	14,770	15,762	16,530
Allergy..................................	1,414	1,473	1,541	1,598	1,629	1,661	1,706
Cardiovascular disease.................	3,928	4,128	4,311	4,643	5,132	5,602	5,970
Dermatology..............................	3,156	3,279	3,407	3,538	3,656	3,775	3,870
Gastroenterology........................	1,198	1,247	1,344	1,489	1,591	1,748	1,916
Pediatric allergy.......................	240	283	270	299	299	398	372
Pediatric cardiology....................	234	249	311	366	373	441	456
Pulmonary diseases......................	2,121	2,094	2,104	2,112	2,090	2,137	2,240
Surgical specialties....................	67,745	70,415	73,185	76,178	79,025	81,820	82,912
General surgery.........................	23,607	24,564	25,643	26,628	27,490	28,433	28,603
Neurological surgery....................	1,818	1,933	2,041	2,185	2,310	2,419	2,484
Obstetrics/gynecology..................	15,296	15,866	16,379	16,973	17,479	18,017	18,084
Ophthalmology...........................	7,833	8,092	8,380	8,718	9,065	9,368	9,578
Orthopedic surgery......................	6,827	7,207	7,557	7,990	8,434	8,869	9,227
Otolaryngology..........................	4,724	4,776	4,851	4,946	5,086	5,195	5,272
Plastic surgery.........................	1,023	1,090	1,167	1,243	1,342	1,414	1,593
Colon and rectal surgery...............	740	728	715	712	708	707	666
Thoracic surgery........................	1,296	1,374	1,473	1,622	1,720	1,822	1,847
Urology..................................	4,581	4,785	4,979	5,161	5,391	5,576	5,638
Other specialties.......................	71,621	74,811	78,012	81,477	84,696	81,970	89,249
Aerospace medicine......................	1,554	1,619	1,603	1,652	1,611	1,456	1,319
Anesthesiology..........................	7,593	8,124	8,592	9,055	9,572	10,112	10,434
Child psychiatry........................	751	980	1,154	1,353	1,525	1,702	1,898
Neurology................................	1,822	2,037	2,198	2,320	2,493	2,675	2,850
Occupational medicine..................	2,911	2,867	2,801	2,772	2,738	2,702	2,746
Pathology 3/............................	7,127	7,676	8,233	8,694	9,232	9,696	10,023
Physical medicine and rehabilitation...	999	1,096	1,162	1,222	1,295	1,407	1,415
Psychiatry...............................	15,551	16,377	17,333	18,290	19,137	19,907	20,328
Public health 4/........................	3,884	3,980	3,988	3,994	3,919	3,871	3,894
Radiology 5/............................	8,786	9,175	9,686	10,230	10,921	11,718	12,367
Other and unspecified..................	20,643	20,880	21,262	21,8[illegible]	22,253	16,724	21,975

Table A-IV-1. Trend in number of active physicians (M.D.), by specialty: 1963-1976 (cont)

Specialty	1970	1971	1972	1973	1974	1975	1976
Total active M.D.'s 1/	301,845	318,699	320,903	324,367	330,266	340,280	348,443
Primary care	117,761	121,599	122,952	123,776	126,431	130,634	135,881
General practice 2/	57,948	56,358	55,348	53,946	53,997	54,557	55,479
Internal medicine	41,872	46,202	47,994	49,899	51,752	54,331	57,911
Pediatrics	17,941	19,039	19,610	19,931	20,682	21,746	22,491
Other medical specialties	17,401	16,685	16,549	17,034	17,485	19,010	18,955
Allergy	1,719	1,641	1,638	1,640	1,657	1,716	1,704
Cardiovascular disease	6,476	6,016	5,883	6,159	6,229	6,933	6,769
Dermatology	4,003	4,149	4,227	4,340	4,479	4,661	4,817
Gastroenterology	2,010	1,857	1,839	1,983	2,063	2,381	2,374
Pediatric allergy	391	387	383	409	429	446	477
Pediatric cardiology	487	492	514	509	534	538	548
Pulmonary disease	2,315	2,143	2,065	2,054	2,094	2,335	2,266
Surgical specialties	86,042	89,779	91,058	91,549	93,386	96,015	98,667
General surgery	29,761	30,897	30,989	30,857	31,085	31,562	32,292
Neurological surgery	2,578	2,721	2,753	2,809	2,859	2,926	2,985
Obstetrics/gynecology	18,876	19,770	20,282	20,494	20,987	21,731	22,294
Ophthalmology	9,927	10,252	10,443	10,496	10,741	11,129	11,455
Orthopedic surgery	9,620	10,121	10,356	10,587	10,985	11,379	11,814
Otolaryngology	5,109	5,592	5,662	5,484	5,588	5,745	5,864
Plastic surgery	1,600	1,688	1,786	1,991	2,088	2,236	2,351
Colon and rectal surgery	667	654	649	658	662	661	673
Thoracic surgery	1,809	1,928	1,927	1,875	1,925	1,979	2,036
Urology	5,795	6,156	6,291	6,298	6,466	6,667	6,903
Other specialties	89,641	90,636	90,344	91,948	92,964	94,621	94,940
Aerospace medicine	1,188	1,046	921	779	708	684	660
Anesthesiology	10,860	11,557	11,853	12,196	12,484	12,861	13,182
Child psychiatry	2,090	2,171	2,268	2,362	2,411	2,581	2,644
Neurology	3,074	3,317	3,494	3,741	3,839	4,131	4,425
Occupational medicine	2,713	2,624	2,506	2,374	2,365	2,355	2,322
Pathology 3/	10,483	11,103	11,218	11,498	11,591	11,910	12,126
Physical medicine and rehabilatation	1,479	1,563	1,551	1,569	1,610	1,664	1,715
Psychiatry	21,146	22,279	22,570	22,701	23,302	23,922	24,432
Public health 4/	3,833	3,881	3,746	3,506	3,453	3,454	3,408
Radiology 5/	13,368	14,339	14,917	15,345	15,753	16,240	16,769
Other and unspecified	19,415	16,836	15,300	15,877	15,448	14,819	13,257

Table A-IV-1. Trend in number of active physicians (M.D.), by specialty: 1963-1976 (cont)

1/ Excludes physicians not classified: 1970--358, 1971--3,529, 1972--12,356, 1973--13,744, 1974--20,343, 1975--26,145, 1976--30,129.
2/ Includes family practice 1970-76.
3/ Includes forensic pathology.
4/ Includes general preventive medicine.
5/ Includes diagnostic and therapeutic radiology.

Source: Annual Reports on Distribution of Physicians in the U.S. by the American Medical Association.

Note: Due to a change in the AMA classification procedure in 1968, there exists a discontinuity in the figures published by the AMA between those for 1963-67 and those for 1968-74. In this table the 1963-67 figures have been adjusted to provide a comparable series using data in: Theodore, C.N. et al. Reclassification of Physicians, 1968. Chicago, American Medical Association, 1971.

Table A-IV-2. Trend in number of active physicians (M.D.) per 100,000 population, by specialty: 1963-76

Specialty	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Phys/pop total active M.D.'s 1/......	134.8	136.9	139.3	141.8	144.4	144.0	145.8	148.3	150.6	150.7	151.2	152.7	156.1	158.6
Primary care....................	56.7	56.6	56.8	56.6	56.7	56.7	55.0	56.2	57.5	57.7	57.6	58.5	59.9	61.9
General practice 2/...........	34.4	33.5	32.6	31.7	30.8	29.9	28.3	27.7	26.6	26.0	25.1	25.0	25.0	25.3
Internal medicine.............	15.7	16.4	17.0	17.5	18.2	18.7	18.4	20.0	21.8	22.5	23.3	23.9	24.9	26.4
Pediatrics....................	6.6	6.8	7.2	7.4	7.8	8.1	8.2	8.6	9[illegible]	9.2	9.3	9.6	10.0	10.2
Other medical specialties......	6.3	6.5	6.7	7.0	7.3	7.7	8.0	8.3	7[illegible]	7.8	8.0	8.1	8.7	8.6
Allergy.......................	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Cardiovascular disease........	2.0	2.1	2.2	2.3	2.5	2.7	2.9	3.1	2.8	2.8	2.9	2.9	3.2	3.1
Dermatology...................	1.6	1.7	1.7	1.8	1.8	1.8	1.9	1[illegible]	2.0	2.0	2.0	2.1	2.1	2.2
Gastroenterology..............	0.6	0.6	0.7	0.7	0.8	0.8	0.9	1.[illegible]	0.9	0.9	0.9	1.0	1.0	1.1
Pediatric allergy.............	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Pediatric cardiology..........	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.[illegible]	0.2	0.2	0.2	0.2	0.3	0.2
Pulmonary diseases............	1.1	1.1	1.1	1.0	1.0	1.0	1.1	[illegible]1	1.0	1.0	1.0	1.0	1.1	1.0
Surgical specialties...........	34.9	35.8	36.7	37.8	38.8	39.8	39.9	41.1	42.4	42.8	42.7	43.2	44.0	44.9
General surgery............	12.2	12.5	12.9	13.2	13.5	13.8	13.8	14.2	14.6	14.6	14.4	14.4	14.5	14.7
Neurological surgery..........	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.4
Obstetrics/gynecology.........	7.9	8.1	8.2	8.4	8.6	8.8	8.7	9.0	9.3	9.5	9.6	9.7	10.0	10.1
Ophthalmology.................	4.0	4.1	4.2	4.3	4.5	4.6	4.6	4.7	4.8	4.9	4.9	5.0	5.1	5.2
Orthopedic surgery	3.5	3.7	3.8	4.0	4.1	4.3	4.4	4.6	4.8	4.9	4.9	5.1	5.2	5.4
Otolaryngology................	2.4	2.4	2.4	2.5	2.5	2.5	2.5	2.6	2.6	2.7	2.6	2.6	2.6	2.7
Plastic surgery...............	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.9	1.0	1.0	1.1
Colon and rectal surgery......	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Thoracic surgery..............	0.7	0.7	0.7	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Urology.......................	2.4	2.4	2.5	2.6	2.6	2.7	2.7	2.8	2.9	3.0	2.9	3.0	3.1	3.1
Other specialties..............	36.9	38.0	39.1	40.4	41.6	39.8	42.9	42.8	42.8	42.4	42.9	43.0	43.4	43.2
Aerospace medicine............	0.8	0.8	0.8	8	0.8	0.7	0.6	0.6	0.5	0.4	0.4	0.3	0.3	0.3
Anesthesiology................	3.9	4.1	4.3	.5	4.7	4.9	5.0	5.2	5.5	5.6	5.7	5.8	5.9	6.0
Child psychiatry..............	0.4	0.5	0.6	0.7	0.7	0.8	0.9	1.0	1.0	1.1	1.1	1.1	1.2	1.2
Neurology.....................	0.9	1.0	1.1	1.2	1.2	1.3	1.4	1.5	1.6	1.6	1.7	1.8	1.9	2.0
Occupational medicine.........	1.5	1.5	1.4	1.4	1.3	1.3	1.3	1.3	1.2	1.2	1.1	1.1	1.1	1.1
Pathology 3/..................	3.7	3.9	4.1	4.3	4.5	4.7	4.8	5.0	5.2	5.3	5.4	5.4	5.5	5.5
Phys med & rehab..............	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8
Psychiatry....................	8.0	8.3	8.7	9.1	9.4	9.7	9.8	10.1	10.5	10.6	10.6	10.8	11.0	11.1
Public health 4/..............	2.0	2.0	2.0	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.6	1.6	1.6	1.6
Radiology 5/..................	4.5	4.7	4.9	5.1	5.4	5.7	5.9	6.4	6.8	7.0	7.2	7.3	7.4	7.6
Other and unspecified.........	10.6	10.6	10.7	10.9	10.9	8.1	10.6	9.3	8.0	7.2	7.4	7.2	6.8	6.0

Table A-IV-2. Trend in number of active physicians (M.D.) per 100,000 population, by specialty: 1963-76 (cont)

1/ Excludes physicians not classified: 1970--358, 1971--3,529, 1972--12,356, 1973--13,744, 1974--20,343, 1975--26,145, 1976--30,129.

2/ Includes family practice 1970-76.

3/ Includes forensic pathology.

4/ Includes general preventive medicine.

5/ Incluces diagnostic and therapeutic radiology.

Source: Computed from numbers in Annual Reports on Distribution of Physicians in the U.S. by the American Medical Association. Populations used include resident population in 50 States, D.C., Puerto Rico, and outlying areas and armed forces overseas as follows: 1963--194,169; 1964--196,858; 1965--199,278; 1966--201,585; 1967--203,704; 1968--205,758; 1969--207,863; 1970--209,539; 1971--211,578; 1972--212,971; 1973--214,573; 1974--216,282; 1975--217,991; 1976--219,673.

Note: Due to a change in the AMA classification procedure in 1968, there exists a discontinuity in the figures published by the AMA between those for 1963-67 and those for 1968-74. In this table the 1963-67 figures have been adjusted to provide a comparable series using data in: Theodore, C.N. et al. Reclassification of Physicians, 1968. Chicago, American Medical Association, 1971.

Table A-IV-3. Trend in the percent distribution of active physicians (M.D.), by specialty: 1963-76

Specialty	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Total active M.D.'s 1/	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Primary care	42.1	41.4	40.7	40.0	39.3	39.4	37.6	37.9	38.2	38.3	38.1	38.3	38.3	39.0
General practice 2/	25.6	24.4	23.4	22.4	21.3	20.8	19.4	18.6	17.7	17.2	16.6	16.3	16.0	15.9
Internal medicine	11.6	12.0	12.2	12.4	12.6	13.0	12.6	13.5	14.5	15.0	15.4	15.7	15.9	16.6
Pediatrics	4.9	5.0	5.1	5.2	5.4	5.6	5.6	5.8	6.0	6.1	6.1	6.3	6.4	6.5
Other medical specialties	4.7	4.7	4.8	4.9	5.0	5.3	5.5	5.6	5.2	5.2	5.3	5.3	5.9	5.4
Allergy	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5
Cardiovascular disease	1.5	1.5	1.6	1.6	1.7	1.9	2.0	2.1	1.9	1.8	1.9	1.9	2.0	1.9
Dermatology	1.2	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.4
Gastroenterology	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7
Pediatric allergy	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Pediatric cardiology	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Pulmonary disease	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.9	0.6
Surgical specialties	25.9	26.2	26.2	26.5	26.8	27.7	27.3	27.7	28.2	28.6	28.2	28.4	28.1	28.3
General surgery	9.0	9.1	9.2	9.3	9.3	9.6	9.4	9.6	9.7	9.7	9.5	9.4	9.2	9.3
Neurological surgery	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.8	0.8
Obstetrics/gynecology	5.8	5.9	5.9	5.9	5.9	6.1	6.0	6.1	6.2	6.3	6.3	6.4	6.4	6.4
Ophthalmology	3.0	3.0	3.0	3.0	3.1	3.2	3.2	3.2	3.2	3.3	3.2	3.3	3.3	3.3
Orthopedic surgery	2.6	2.7	2.7	2.8	2.9	3.0	3.0	3.1	3.2	3.2	3.3	3.3	3.3	3.4
Otolaryngology	1.8	1.8	1.7	1.7	1.7	1.8	1.7	1.7	1.8	1.8	1.7	1.7	1.7	1.7
Plastic surgery	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6
Colon and rectal surgery	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Thoracic surgery	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Urology	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	2.0	1.9	2.0	2.0	2.0
Other specialties	27.4	27.8	28.1	28.5	28.8	27.7	29.5	28.8	28.4	28.2	28.3	28.1	27.7	27.3
Aerospace medicine	0.6	0.6	0.6	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2
Anesthesiology	2.9	3.0	3.1	3.2	3.3	3.4	3.4	3.5	3.6	3.7	3.8	3.8	3.8	3.7
Child psychiatry	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8
Neurology	0.7	0.8	0.8	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.2	0.3	1.2	1.3
Occupational medicine	1.1	1.1	1.0	1.0	0.9	0.9	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.7
Pathology 3/	2.7	2.8	3.0	3.0	[illegible]	3.3	3.3	3.4	3.5	3.5	3.5	3.5	3.4	3.5
Phys med & rehab	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	[illegible]	0.5	0.5	0.5
Psychiatry	5.9	6.1	6.2	6.4	6.5	6.7	6.7	6.8	7.0	7.0	7.0	7.1	7.0	7.0
Public health 4/	1.5	1.5	1.4	1.4	1.3	1.3	1.3	1.2	1.2	1.2	1.1	1.0	1.0	1.0
Radiology 5/	3.4	3.4	3.5	3.6	3.7	4.0	4.1	4.3	4.5	4.6	4.7	4.8	4.8	4.8
Other and unspecified	7.9	7.7	7.7	7.7	7.5	5.6	7.3	6.2	5.3	4.8	4.9	4.7	4.3	3.8

Table A-IV-3. Trend in the percent distribution of active physicians (M.D.), by specialty: 1963-76 (cont)

1/ Excludes physicians not classified: 1970--358, 1971--3,529, 1972--12,356, 1973--13,744, 1974--20,343, 1975--26,145, 1976--30,129.
2/ Includes family practice 1970-76.
3/ Includes forensic pathology.
4/ Includes general preventive medicine.
5/ Includes diagnostic and therapeutic radiology.

Source: Computed from numbers in Annual Reports on Distribution of Physicians in the U.S. by the American Medical Association.

Note: Due to a change in the AMA classification procedure in 1968, there exists a discontinuity in the figures published by the AMA between those for 1963-67 and those for 1968-74. In this table the 1963-67 figures have been adjusted to provide a comparable series using data in: Theodore, C.N. et al. Reclassification of Physicians, 1968. Chicago, American Medical Association, 1971.

Table A-IV-4. Number and percent distribution of office visits by physician specialty, according to principal diagnosis: United States, May 1973-April 1974

Principal diagnosis classification	ICDA Category 1/	Number of visits in thousands	Physician specialty			
			General practice	Medical specialties	Surgical specialties	Other specialties
			Percent distribution			
All diagnosis		644,893	40.4	26.3	28.5	4.9
Infective and parasitic diseases	000-136	25,233	35.2	35.9	17.1	-
Neoplasm	140-239	12,713	21.3	22.7	54.0	-
Endocrine, nutritional and Metabolic diseases	240-279	26,099	58.2	30.0	10.3	-
Diabetics mellitus	250	8,904	55.2	34.6	-	-
Obesity	277	10.136	64.4	25.1	9.9	-
Mental disorders	290-315	29,064	25.2	15.9	4.7	54.2
Neuroses	300	16,570	29.9	18.2	-	48.0
Diseases of nervous system and sense organs	320-389	50,841	20.3	17.7	58.3	3.7
Diseases and conditions of the eye	360-379	15,248	11.3	-	82.7	-
Refractive errors	370	9,175	-	-	99.3	-
Otitis media	381	10,523	25.5	47.5	24.6	-
Diseases of circulatory system	390-458	59,2[illegible]3	50.0	37.1	9.8	3.1
Essential benign hypertension	401	22,752	54.0	35.2	8.2	-
Diseases of respiratory system	460-519	97,383	49.9	36.0	12.1	2.0
Acute respiratory infections (except influenza)	460-466	50,859	57.9	29.1	10.9	2.1
Influenza	470-474	5,199	75.4	-	-	-
Hay fever	507	12,166	18.7	63.2	16.1	-
Diseases of digestive system	520-577	23,826	43.0	30.4	25.0	-

Table A-IV-4. Number and percent distribution of office visits by physician specialty according to principal diagnosis: United States, May 1973-April 1974 (cont.)

Principal diagnosis classification	ICDA Category 1/	Number of visits in thousands	General practice	Physician specialty		
				Medical specialties	Surgical specialties	Other specialties
Diseases of genitourinary system	580-629	37,744	41.9	10.4	47.1	-
Diseases of male genital organs	600-607	3,596	45.6	-	47.0	-
Diseases of female genital organs	610-629	21,895	40.6	9.2	49.7	-
Diseases of skin and subcutaneous tissue	680-709	34,099	36.6	47.5	11.5	4.4
Diseases of musculoskeletal system	.0-738	34,370	45.7	22.0	29.9	-
Arthritis and rheumatism	710-718	18,463	52.9	27.3	16.8	-
Symptoms and Ill-defined conditions	780-796	36,251	33.6	26.4	33.2	6.8
Accidents, poisoning, and violence	800-999	47,609	51.1	13.2	33.7	2.1
Fractures	800-829	7,984	40.3	-	54.3	-
Dislocation, sprain	830-848	15,408	53.8	10.6	32.2	-
Lacerations	870-907	9,131	59.4	17.3	24.1	-
Special conditions and examinations without illness	Y00-Y13	110,203	32.8	20.6	44.4	2.2
Medical and special exams	Y00	39,613	39.1	39.7	18.9	-
Prenatal care	Y06	25,359	30.5	-	67.1	-
Medical and surgical aftercare	Y10	32,345	23.6	11.2	62.7	-
Other diagnoses 2/		8 630	42.1	27.3	29.8	-
Diagnosis given as "none"		8,019	37.3	27.0	33.4	-
Diagnosis unknown 3/		5,569	39.6	26.7	31.5	-

1/ Diagnostic groupings and code number inclusions are based on the "Eighth Revision International Classification of Diseases, Adapted for use in the United States, 1965."

2/ 280-289, Diseases of the blood and blood-forming organs; 630-678, Complications of pregnancy, childbirth, and the puerperium; 740-759, Congenital anomalies; 760-779, certain causes of perinatal morbidity and mortality.

3/ Blank diagnosis; noncodable diagnosis; illegible diagnosis.

4/ These numbers are not available because they do not meet NCHS standards of reliability and precision.

Source: National Ambulatory Medical Care Survey, DHEW Publcation No. (HRA) 76-1772, May 1976.

Table A-IV-5. Geographic distribution of non-Federal physicians (M.D.'s) in patient care by State, per 100,000 population: December 31, 1975

State	Patient care physicians per 100,000	GP/FP per 100,000	Internal medicine per 100,000	Pediatrics per 100,000	Primary care physicians per 100,000	Obs/gyn per 100,000	Other specialties per 100,000
United States	135	24	21	9	53	9	73
Alabama	86	19	11	6	36	7	43
Alaska	85	25	9	5	39	6	40
Arizona	139	28	17	10	57	10	75
Arkansas	85	28	8	3	39	5	42
California	173	31	25	11	67	11	95
Colorado	151	26	21	11	58	10	83
Connecticut	177	19	34	13	66	12	99
Delaware	127	22	17	9	48	11	68
District of Columbia	343	24	72	26	122	27	194
Florida	132	21	18	8	47	10	76
Georgia	106	18	15	7	40	9	56
Hawaii	148	24	22	13	59	12	77
Idaho	88	30	7	4	40	5	43
Illinois	132	25	21	9	54	9	68
Indiana	96	30	10	4	43	5	48
Iowa	95	30	10	4	44	5	46
Kansas	113	28	16	5	49	6	58
Kentucky	101	25	12	7	44	7	50
Louisiana	106	21	13	7	41	9	57
Maine	107	24	15	5	44	5	58
Maryland	165	19	29	14	63	15	88
Massachusetts	182	19	35	13	66	10	105
Michigan	119	18	21	7	46	10	64
Minnesota	138	33	22	6	61	7	69
Mississippi	81	23	8	5	36	6	38
Missouri	117	16	20	7	44	9	64
Montana	101	30	10	5	45	5	50
Nebraska	109	34	16	6	53	5	51
Nevada	109	26	8	5	38	7	64

Table A-IV-5. Geographic distribution of non-Federal physicians (M.D.'s) in patient care by State, per 100,000 population: December 31, 1975 (cont)

State	Patient care physicians per 100,000	GP/FP per 100,000	Internal medicine per 100,000	Pediatrics per 100,000	Primary care physicians per 100,000	Obs/gyn per 100,000	Other specialties per 100,000
New Hampshire	131	26	20	7	53	7	71
New Jersey	140	20	24	10	54	11	75
New Mexico	101	18	14	7	40	7	54
New York	202	22	39	16	77	11	110
North Carolina	105	22	15	7	43	8	54
North Dakota	92	29	10	3	43	4	45
Ohio	122	22	19	8	49	8	65
Oklahoma	95	22	11	5	38	7	51
Oregon	138	28	20	6	54	8	76
Pennsylvania	139	26	21	7	54	9	75
Rhode Island	161	19	35	13	67	10	85
South Carolina	93	26	10	6	42	7	45
South Dakota	77	27	6	3	36	3	38
Tennessee	113	19	17	7	43	8	62
Texas	112	24	14	7	44	8	59
Utah	130	24	17	8	49	9	72
Vermont	156	27	28	9	65	8	83
Virginia	120	23	38	9	48	9	62
Washington	137	31	16	7	55	8	75
West Virginia	108	21	13	5	40	6	54
Wisconsin	114	25	15	7	47	7	60
Wyoming	90	34	6	3	43	5	42

Source: Goodman, L.J., H.R. Mason. Physician Distribution and Medical Licensure in the U.S., 1975. Chicago: American Medical Association, 1976.

Table A-IV-6. Active non-Federal osteopathic physicians and physician/population ratios, by State of practice: 1975

State of practice	Number of active non-Federal osteopathic physicians	Civilian population July 1, 1975 (000's)	Rate per 100,000 Population
United States	13,470	211,392	6.4
Alabama	5	3,577	0.1
Alaska	3	337	0.9
Arizona	363	2,153	16.9
Arkansas	11	2,062	0.5
California	118	20,907	0.6
Colorado	255	2,496	10.2
Connecticut	38	3,085	1.2
Delaware	43	593	7.5
District of Columbia .	9	723	1.3
Florida	736	8,040	9.1
Georgia	111	4,882	2.3
Hawaii	20	847	2.4
Idaho	20	799	2.5
Illinois	302	11,131	2.7
Indiana	170	5,330	3.2
Iowa	384	2,855	13.4
Kansas	183	2,270	8.1
Kentucky	36	3,357	1.1
Louisiana	13	3,764	0.4
Maine	179	1,047	14.1
Maryland	22	4,094	0.5
Massachusetts	152	5,800	2.6
Michigan	2,360	9,098	25.9
Minnesota	54	3,917	1.4
Mississippi	2	2,324	0.1
Missouri	1,053	4,777	22.2
Montana	19	735	2.6
Nebraska	27	1,543	1.8
Nevada	26	573	4.5
New Hampshire	14	808	1.7
New Jersey	860	7,330	11.7
New Mexico	124	1,120	11.1
New York	556	18,111	3.1
North Carolina	21	5,363	0.4
North Dakota	6	637	0.9
Ohio	1,193	10,737	11.1
Oklahoma	431	2,709	15.9
Oregon	66	2,266	7.3
Pennsylvania	1,754	11,835	14.8
Rhode Island	77	937	8.2
South Carolina	6	2,734	0.2
South Dakota	23	682	3.4
Tennessee	55	4,124	1.3
Texas	842	12,050	6.9
Utah	17	1,173	1.4
Vermont	30	470	6.4
Virginia	35	4,908	0.7
Washington	174	3,476	5.0
West Virginia	74	1,791	4.1
Wisconsin	172	4,506	3.8
Wyoming	7	359	2.1

Source: American Osteopathic Association directory: 1975.
U.S. Bureau of the Census, Series P-25, No. 601.

Name of School	First Year		Intermediate		Graduates 7/1/75 to 6/30/76		Total Enrollment
	Men	Women	Men	Women	Men	Women	
Alabama							
Alabama, Univ of	115	32	158	30	97	15	447
South Alabama	58	8	101	25	19	1	213
Arizona							
Arizona, Univ of	61	38	74	22	61	18	274
Arkansas							
Arkansas, Univ of	93	30	204	35	114	6	482
California							
California, Davis	73	29	153	52	69	33	409
California, Irvine	64	14	124	31	58	14	305
California, Los Angeles	108	39	268	48	138	23	625
California, San Diego	84	13	132	27	48	17	320
California, San Francisco	98	68	186	95	129	32	608
Loma Linda	135	40	258	65	129	22	640
Southern California	119	20	209	54	90	25	517
Stanford	68	27	174	63	67	16	396
Colorado							
Colorado, Univ of	97	31	199	66	111	22	528
Connecticut							
Connecticut, Univ of	56	24	102	20	62	8	272
Yale	74	28	150	63	74	16	405
District of Columbia							
Georgetown	168	42	336	75	168	28	817
George Washington	186	44	229	73	121	28	681
Howard	98	44	130	74	102	29	478
Florida							
Florida, Univ of	94	26	182	49	73	9	433
Miami	136	28	198	38	177	28	607
South Florida	64	11	53	11	26	6	171
Georgia							
Emory	81	31	180	27	87	16	442
Georgia, Med Coll of	140	44	289	49	142	21	685
Hawaii							
Hawaii, Univ of	45	21	115	31	48	7	255
Illinois							
Chicago Medical	90	35	98	9	158	12	403
Chicago, Pritzker	87	18	192	43	100	15	455
Illinois, Univ of	270	79	548	106	238	30	1,272
Loyola, Stritch	108	36	113	23	202	54	536
Northwestern	129	42	275	73	141	36	648
Rush	80	32	136	34	35	17	334
Southern Illinois	66	11	44	8	30	5	166

Table A-IV-7. U.S. Medical School Enrollment by State by Sex for 1975-1976

Name of School	First Year		Intermediate		7/1/75 to 6/30/76		Total Enroll-ment
	Men	Women	Men	Women	Men	Women	
Indiana							
Indiana, Univ of	262	58	563	113	236	34	1,266
Iowa							
Iowa, Univ of	143	34	291	56	126	22	672
Kansas							
Kansas, Univ of	188	29	127	36	165	23	568
Kentucky							
Kentucky, Univ of	87	26	174	44	82	16	429
Louisville	105	30	215	55	120	15	540
Louisiana							
Louisiana, New Orleans	152	30	234	45	132	19	612
Louisiana, Shreveport	81	16	82	7	36	2	224
Tulane	116	33	251	46	122	26	594
Maryland							
Johns Hopkins	99	23	191	42	104	22	481
Maryland, Univ of	131	42	262	80	135	23	673
Massachusetts							
Boston	98	41	205	72	91	31	538
Harvard	106	58	236	102	146	36	684
Tufts	89	51	224	89	124	40	617
Massachusetts, Univ of	77	25	81	23	20	6	232
Michigan							
Michigan, Univ of	175	72	365	111	181	43	947
Michigan State	65	40	136	87	65	24	417
Wayne State	205	56	443	81	209	30	1,024
Minnesota							
Mayo	30	10	64	16	33	6	159
Minnesota, Minneapolis	199	49	412	93	205	37	1,005
Mississippi							
Mississippi, Univ of	122	29	223	40	105	10	529
Missouri							
Missouri, Columbia	87	27	191	38	84	17	444
Missouri, Kansas City	39	22	83	33	20	3	200
Saint Louis	135	27	248	49	131	8	598
Washington, St Louis	101	28	192	63	128	29	541
Nebraska							
Creighton	98	12	194	24	100	12	440
Nebraska, Univ of	130	25	137	29	131	15	467
New Hampshire							
Dartmouth	51	17	45	17	30	8	168

Table A-IV-7. U.S. Medical School Enrollment by State by Sex for 1975-1976

Name of School	First Year		Intermediate		Graduates 7/1/75 to 6/30/76		Total Enroll-ment
	Men	Women	Men	Women	Men	Women	
New Jersey							
CMDNJ-Newark	88	31	184	58	102	26	489
CMDNJ-Rutgers	72	38	117	44	38	18	327
New Mexico							
New Mexico, Univ of	83	15	98	41	31	14	282
New York							
Albany	83	27	176	48	97	16	447
Columbia	99	51	209	92	112	31	594
Cornell	74	28	154	55	88	18	417
Einstein	129	54	167	67	126	48	591
Mount Sinai	67	18	132	41	56	19	333
New York Medical	123	57	279	79	165	29	732
New York Univ	120	51	279	81	130	31	692
Rochester	72	26	152	44	87	10	391
SUNY, Buffalo	96	48	210	57	114	31	556
SUNY, Downstate	166	58	343	101	187	24	879
SUNY, Stony Brook	24	23	26	26	22	10	131
SUNY, Upstate	88	38	192	51	99	20	488
North Carolina							
Bowman Gray	79	22	148	36	79	6	370
Duke	83	36	194	64	102	15	494
North Carolina, Univ of	109	31	209	53	96	27	525
North Dakota							
North Dakota, Univ of	56	12	92	13	38	2	213
Ohio							
Case Western Reserve	102	43	218	71	119	29	582
Cincinnati	150	44	273	59	102	12	640
Ohio State	198	45	221	47	177	31	719
Ohio, Toledo	72	28	64	20	53	13	250
Oklahoma							
Oklahoma, Univ of	145	23	268	44	117	22	619
Oregon							
Oregon, Univ of	91	24	193	41	98	14	461
Pennsylvania							
Hahnemann	145	37	268	60	139	24	673
Jefferson	182	47	370	77	187	30	893
Pennsylvania, Med Coll of	39	67	60	139	39	56	400
Pennsylvania, Univ of	116	44	248	84	130	25	648
Pennsylvania State, Hershey	77	24	143	33	61	18	356
Pittsburgh	102	36	205	59	110	23	535
Temple	148	38	278	82	152	27	725
Puerto Rico							
Puerto Rico, Univ of	89	46	164	65	88	26	478

Name of School	First Year		Intermediate		Graduates 7/1/75 to 6/30/76		Total Enrollment
	Men	Women	Men	Women	Men	Women	
Rhode Island							
Brown	43	19	92	33	45	15	247
South Carolina							
South Carolina, Univ of	147	28	279	43	144	17	658
South Dakota							
South Dakota, Univ of	50	15	89	14	...	...	168
Tennessee							
Meharry	94	32	147	56	67	25	421
Tennessee, Univ of	175	34	266	42	180	25	722
Vanderbilt	84	19	142	22	61	6	334
Texas							
Baylor	133	35	216	51	147	29	611
Texas, Galveston	160	46	318	84	136	21	765
Texas, Houston	51	16	86	15	...	...	168
Texas, San Antonio	95	31	203	43	104	17	493
Texas, Southwestern	169	33	304	48	122	16	692
Texas Tech	38	6	33	13	34	8	132
Utah							
Utah, Univ of	87	14	169	30	96	4	400
Vermont							
Vermont, Univ of	85	20	133	37	46	9	330
Virginia							
Eastern Virginia	35	14	49	12	...	...	110
Virginia, Med Coll of	132	37	251	45	118	23	606
Virginia, Univ of	110	29	197	37	121	8	502
Washington							
Washington, Univ of	125	50	221	61	96	21	574
West Virginia							
West Virginia, Univ of	67	17	147	24	78	4	337
Wisconsin							
Wisconsin, Med Coll of	100	25	209	37	113	12	496
Wisconsin, Univ of	126	33	248	81	113	24	625
Subtotal	11,624	3,643	21,596	5,651	11,361	2,200	56,075
Basic Science Schools							
Minnesota							
Minnesota, Duluth	32	4	28	8	...	...	72
Nevada							
Nevada, Univ of	39	9	37	12	...	...	97
Subtotal	71	13	65	20	...	...	169
Total	11,695	3,656	21,661	5,671	11,361	2,200	56,244

Source: American Medical Association. Journal of American Medical Association, Vol. 236, No. 76, Dec. 27, 1976. Chicago, Ill.

Table A-IV-8. Numbers of students and graduates in Osteopathic colleges: 1975-76

School	Total enrollment			First-year enrollment			Graduates
	All students	Male	Female	All students	Male	Female	
Total	3,405	3,064	341	1,002	878	124	806
Chicago College of Osteopathic Medicine, Chicago	380	354	26	96	89	7	92
College of Osteopathic Medicine-Michigan State University, East Lansing, Michigan	260	195	65	95	76	19	68
College of Osteopathic Medicine and Surgery, Des Moines, Iowa	521	480	41	179	154	25	174
Kansas City College of Osteopathic Medicine, Kansas City, Mo.	577	540	37	163	149	14	127
Kirksville College of Osteopathic Medicine, Kirksville, Mo.	493	438	55	125	107	18	115
Oklahoma College of Osteopathic Medicine and Surgery, Tulsa, Okla. .	91	84	7	56	51	5	-
Philadelphia College of Osteopathic Medicine, Philadelphia	798	713	85	200	170	30	182
Texas College of Osteopathic Medicine, Fort Worth, Texas	208	199	18	46	43	3	48
West Virginia School of Osteopathic Medicine, Lewisburg, W. Va.	77	70	7	42	39	3	-

Enrollments:
Source: Journal AOA Almanac/vol. 75, Educational Supplement: April 1976.
Graduates:
Source: The DO/September 1976.

Table A-IV-9. Women applicants and first year enrollments in U.S. medical and osteopathic schools: selected years, 1970-71 through 1975-76

Academic year	Women applicants		Women in entering class				Women as percent of total FYE 1/
	M.D.'s		M.D.'s		D.O.'s		
	Number	Percent	Number	Percent	Number	Percent	
1970-71..................	2,734	10.9	1,256	11.1	17	2.7	10.6
1971-72..................	3,737	12.8	1,693	13.7	29	4.3	13.2
1972-73..................	5,480	15.2	2,315	16.9	56	7.0	16.3
1973-74..................	7,202	17.8	2,743	19.6	83	9.4	18.8
1974-75..................	8,712	20.4	3,260	22.3	106	10.9	21.1
1975-76..................	9,575	22.6	[illegible],656	23.8	140	13.5	23.2

1/ Total first year enrollment data for schools of medicine include repeaters and those who re-entered.

Sources: Medical Education in the U.S., 1975-76. JAMA, December 27, 1976.
Educational Supplement and Educational Annual. JAOA, 1950-1976.
Datagram, U.S. Medical School Enrollment, 1969-70 through 1973-74. JME 49:302-307, March 1974.
Datagram, U.S. Medical School Enrollment, 1970-71 through 1974-75. JME 50:303-306, March 1975.
Datagram applicants for 1975-76 first year medical school class. JME 51:867-869, October 1976.

Table A-IV-10. Allopathic and osteopathic students, enrollees, and graduates for selected years

Year	M.D.'s Number schools	D.O.'s Number schools	M.D.'s first year enrollment					D.O.'s first year enrollment				
			Female		Male		Total	Female		Male		Total
			Number	Percent	Number	Percent		Number	Percent	Number	Percent	
1961-62..	87	6	--	--	--	--	--	16	3.0	423	97.0	439
1962-63..	87	5	--	--	--	--	--	7	1.7	426	98.3	433
1963-64..	87	5	--	--	--	--	--	9	2.0	432	98.0	441
1964-65..	88	5	786	9.0	8,070	91.0	8,856	14	3.0	458	97.0	472
1965-66..	88	5	--	--	--	--	--	12	2.6	452	97.4	464
1966-67..	89	5	--	--	--	--	--	14	3.0	466	97.0	480
1967-68..	94	5	--	--	--	--	--	13	2.6	496	97.4	509
1968-69..	99	6	--	--	--	--	--	21	4.0	500	96.0	521
1969-70..	101	6	952	9.0	9,449	91.0	10,401	14	2.4	563	97.6	577
1970-71..	103	7	1,256	11.0	10,092	89.0	11,348	17	2.7	605	97.3	622
1971-72..	108	7	1,693	13.7	10,668	86.3	12,361	29	4.3	641	95.7	670
1972-73..	112	7	2,300	16.8	11,426	83.2	13,726	56	7.0	742	93.0	798
1973-74..	114	7	2,786	19.6	11,399	80.4	14,185	83	9.4	806	90.6	889
1974-75..	114	9	3,275	21.8	11,688	78.2	14,963	106	10.9	859	89.1	965
1975-76..	114	9	3,647	23.8	11,649	76.2	15,296	140	13.5	894	86.5	1,034

Table A-IV-10. Allopathic and osteopathic students, enrollees, and graduates for selected years (cont)

Year	M.D. graduates					D.O. graduates				
	Female		Male		Total	Female		Male		Total
	Number	Percent	Number	Percent		Number	Percent	Number	Percent	
1961-62........	--	--	--	--	--	6	1.7	356	98.3	362
1962-63........	--	--	--	--	--	15	4.1	347	95.9	362
1963-64........	--	--	--	--	--	4	1.1	350	98.9	354
1964-65........	503	6.8	6,906	93.2	7,409	10	2.5	385	97.5	395
1965-66........	524	6,9	7,050	93.1	7,574	5	1.3	694	98.7	369
1966-67........	--	--	--	--	--	9	2.0	396	98.0	405
1967-68........	--	--	--	--	--	13	3.0	414	97.0	427
1968-69........	--	--	--	--	--	8	2.0	419	98.1	427
1969-70........	700	8.4	7,667	91.6	8,367	12	2.8	461	97.7	432
1970-71........	827	9.2	8,147	0.8	8,974	11	2.3	461	97.7	472
1971-72........	860	9.0	8,691	91.0	9,551	18	3.7	487	96.3	505
1972-73........	924	8.9	9,467	91.1	10,391	14	2.2	635	97.8	649
1973-74........	1,264	11.1	10,349	88.9	11,588	14	2.4	580	97.6	594
1974-75........	1,706	13.4	11,008	86.6	12,714	21	3.0	681	96.0	702
1975-76........	2,200	16.2	11,361	83.8	13,561	58	7.2	751	92.8	809

Source: "Medical Education in the U.S., 1975-76. JAMA, December 27, 1976.
1976-1977 Directory, American Osteopathic Association, Chicago, 1976.

Table A-IV-11 Supply of active physicians (M.D. and D.O.) by country of medical education using basic methodology: actual 1974, 1975; projected 1980-90

Category	Year				
	1974	1975	1980	1985	1990
	Number of active physicians				
All active physicians.....	362,500	378,600	444,000	519,000	594,000
U.S. trained............	286,000	296,700	353,600	424,400	495,700
M.D..................	272,400	282,600	335,900	401,100	465,900
D.O..................	13,600	14,011	17,700	23,300	29,000
Canadian-trained M.D.'s.	5,600	5,700	6,000	6,100	6,200
Foreign-trained M.D.'s..	70,900	76,200	84,400	88,500	92,100
	Rate per 100,000 population				
All active physicians.....	171.1	177.3	199.3	221.7	242.4
U.S. trained............	135.0	138.9	158.7	181.3	202.3
M.D..................	128.6	132.3	150.8	171.4	190.1
D.O..................	6.4	6.6	7.9	10.0	12.2
Canadian-trained M.D.'s.	2.6	2.7	2.7	2.6	2.5
Foreign-trained M.D.'s..	33.5	35.7	37.9	37.8	37.6

Sources: 1974, 1975: M.D.'s; see Table A-IV-14.

Population: U.S. Bureau of the Census, Current Population Reports. Series P-25, No. 635 (estimates as of July 1).

1980-1990: M.D.'s; see Text for methodology assumptions.

Population: U.S. Bureau of the Census. Projections of the Population of the United States, 1975-2050. Series P-25, No. 601. Series II Projections.

Table A-IV-12. First-year residency distribution with sub-specialty adjustment: September 1, 1974

Specialty	AMA 3/				Adjustments		Adjusted AMA			
	USMGs/CMGs		FMGs		USMGs/CMGs	FMGs	USMGs/CMGs		FMGs	
	Number	Percent	Number	Percent	Number	Number	Number	Percent	Number	Percent
Total active physicians....	13,618	100.0	5,216	100.0			12,626	100.0	4,755	100.0
Primary care....................	5,978	43.9	1,746	33.5			4,735	37.5	1,394	29.3
General practice.............	23	0.2	139	2.7			23	0.2	139	2.9
Family practice..............	1,131	8.3	68	1.3			1,131	9.0	68	1.4
Internal medicine............	3,591	26.4	962	18.4	-1,144	-306	2,447	19.4	656	13.8
Pediatrics...................	1,233	9.1	577	11.1	- 99	- 46	1,134	9.0	531	11.2
Other medical specialties.......	335	2.5	46	0.8			1,155	9.1	266	5.6
Dermatology..................	248	1.8	16	0.3			248	2.0	16	0.3
Pediatric allergy............	46	0.3	13	0.2			46	0.4	13	0.3
Pediatric cardiology.........	41	0.3	17	0.3			41	0.3	17	0.4
Internal medicine subspecialties 1/	-	-	-	-	+ 820	+220	820	6.5	220	4.6
Surgical specialties............	4,398	32.3	1,454	27.9			3,280	26.0	936	19.7
General surgery..............	1,803	13.2	836	16.0	-1,118	-518	685	5.4	318	6.7
Neurological surgery..........	114	0.8	15	0.3			114	0.9	15	0.3
Obstetrics and gynecology....	742	5.5	288	5.5			742	5.9	288	6.1
Ophthalmology................	468	3.5	36	0.7			468	3.7	36	0.8
Orthopedic surgery...........	547	4.0	62	1.2			547	4.3	62	1.3
Otolaryngology...............	227	1.7	43	0.8			227	1.8	43	0.9
Plastic surgery..............	148	1.1	36	0.7			148	1.2	36	0.8
Colon and rectal surgery....	20	0.1	10	0.2			20	0 2	10	0.2
Thoracic surgery............	97	0.7	50	1.0			97	0.8	50	1.1
Urology.....................	232	1.7	78	1.5			232	1.8	78	1.6

Table A-IV-12. First-year residency distribution with sub-specialty adjustment: September 1, 1974 (cont)

Specialty	AMA 3/				Adjustments		Adjusted AMA			
	USMGs/CMGs		FMGs		USMGs/CMGs	FMGs	USMGs/CMGs		FMGs	
	Number	Percent	Number	Percent	Number	Number	Number	Percent	Number	Percent
Other specialties...............	2,907	20.8	1,970	37.8			3,456	27.4	2,159	45.4
Anesthesiology...............	367	2.7	348	6.7			367	2.9	348	7.3
Neurology....................	272	1.2	109	2.1			252	2.0	109	2.3
Pathology....................	397	2.9	410	7.9	- 11	- 11	386	3.1	399	8.4
Forensic pathology...........	17	0.1	7	0.1			17	0.1	7	0.1
Psychiatry...................	952	7.0	612	11.7	- 180	-116	771	6.1	496	10.4
Child psychiatry.............	189	1.4	98	1.9			189	1.5	98	2.1
Physical medicine and rehabilitation.............	29	0.2	93	1.8			29	0.2	93	2.0
Radiology....................	88	0.7	137	2.6			88	0.7	137	2.9
Diagnostic radiology.........	452	3.3	101	1.9			452	3.6	101	2.1
Therapeutic radiology........	65	0.5	55	1.1			65	0.5	55	1.2
Miscellaneous 2/............	-	-	-	-	+ 840	+316	840	6.7	316	6.7

1/ Includes gastroenterology, pulmonary disease, cardiovascular disease, and allergy.
2/ Includes aerospace medicine, public health, general preventive medicine, occupational medicine, "other", and unspecified.
3/ Pre-publication data from the American Medical Association.

Source: See unpublished paper 77-27.

Table A-IV-13. Percent distribution of active physicians (M.D.) and of first-year residents, by specialty and country of graduation from medical school: 1975

Specialty	Active physicians (M.D.)				First-year residents		
	Total	U.S. medical graduates	Canadian medical graduates	Other foreign medical graduates	Total	U.S. and Canadian medical graduates	Other foreign medical graduates
Total active physicians.......	348,961	272,375	5,645	70,941	17,381	12,626	4,755
Percent of active physicians..	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Primary care.......................	38.3	39.5	29.7	34.1	35.3	37.5	29.3
General practice................	13.6	14.8	11.3	9.3	0.9	0.2	2.9
Family practice.................	2.7	2.9	2.3	2.3	6.9	9.0	1.4
Internal medicine...............	15.7	15.8	11.5	15.5	17.9	19.4	13.8
Pediatrics......................	6.3	6.1	4.6	7.0	9.6	9.0	11.2
Other medical specialties..........	5.3	5.6	5.3	4.3	8.2	9.1	5.6
Dermatology.....................	1.4	1.5	1.4	0.6	1.5	2.0	0.3
Pediatric allergy...............	0.1	0.1	0.2	0.1	0.3	0.4	0.3
Pediatric cardiology............	0.2	0.1	0.2	0.3	0.3	0.3	0.4
Internal medicine subspecialties 1/	3.6	3.8	3.6	3.2	6.0	6.5	4.6
Surgical specialties...............	28.3	29.4	30.5	23.8	24.3	26.0	19.6
General surgery.................	9.4	9.2	8.6	10.1	5.8	5.4	6.7
Neurological surgery............	0.9	0.9	1.6	0.7	0.7	0.9	0.3
Obstetrics and gynecology.......	6.4	6.4	6.6	6.1	5.9	5.9	6.0
Ophthalmology...................	3.3	3.7	3.9	1.4	2.9	3.7	0.8
Orthopedic surgery..............	3.3	3.8	3.9	1.6	3.5	4.3	1.3
Otolaryngology..................	1.7	1.8	2.3	1.1	1.6	1.8	0.9
Plastic surgery.................	0.6	0.7	0.8	0.4	1.1	1.2	0.8
Colon and rectal surgery........	0.2	0.2	0.4	0.1	0.2	0.2	0.2
Thoracic surgery................	0.6	0.6	0.6	0.7	0.9	0.8	1.0
Urology.........................	2.0	2.1	1.8	1.5	1.8	1.8	1.6

Table A-IV-13. Percent distribution of active physicians (M.D.) and of first-year residents, by specialty and country of graduation from medical school: 1975 (cont)

Specialty	Active physicians (M.D.)				First-year residents		
	Total	U.S. medical graduates	Canadian medical graduates	Other foreign medical graduates	Total	U.S. and Canadian medical graduates	Other foreign medical graduates
Other specialties..................	28.1	25.5	34.5	37.8	32.3	27.4	45.7
Anesthesiology.................	3.8	3.0	4.8	6.8	4.1	2.9	7.3
Neurology......................	1.2	1.1	2.0	1.3	2.1	2.0	2.3
Pathology......................	3.4	2.7	4.5	6.1	4.5	3.1	8.4
Forensic pathology.............	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Psychiatry.....................	7.1	6.5	9.9	8.9	7.3	6.1	10.4
Child psychiatry...............	0.7	0.7	1.2	0.8	1.7	1.5	2.1
Physical medicine and rehabilitation................	0.5	0.4	0.6	0.9	0.7	0.2	2.0
Radiology......................	3.5	3.7	3.4	2.8	3.2	0.7	2.9
Diagnostic radiology...........	0.9	1.0	0.6	0.8	3.2	3.6	2.1
Therapeutic radiology..........	0.3	0.3	0.4	0.5	0.7	0.5	1.2
Miscellaneous 2/...............	6.7	6.1	7.0	8.7	6.7	6.7	6.7

1/ Includes gastroenterology, pulmonary disease, cardiovascular disease, and allergy.
2/ Includes aerospace medicine, public health, general preventive medicine, occupational medicine, "other", and unspecified.

Table A-IV-14. First-year residency percent distribution by country of medical education: historical (unadjusted--1967, 1970, 1972 and 1974, historical (adjusted)--1974 and projected (adjusted)--1975 and 1980

Specialty	Historical (unadjusted)							
	1967		1970		1972		1974	
	USMG	FMG	USMG	FMG	USMG	FMG	USMG	FMG
Total active physicians.............	8,480 100.0	4,101 100.0	10,199 100.0	4,357 100.0	11,317 100.0	5,456 100.0	13,519 100.0	5,216 100.0
Primary care..............................	28.6	31.3	30.5	31.8	34.4	32.8	44.2	33.5
General practice..........................	1.1	4.1	0.5	2.1	0.3	2.4	0.2	2.7
Family practice...........................	--	--	1.2	0.3	3.9	1.0	8.4	1.3
Internal medicine.........................	20.0	17.5	21.6	19.3	21.6	20.4	26.6	18.4
Pediatrics................................	7.5	9.7	7.2	10.1	8.6	9.0	9.1	11.1
Other medical specialties.................	2.3	1.4	2.6	1.4	2.5	1.2	2.5	0.8
Dermatology...............................	1.9	0.6	1.9	0.3	1.8	0.4	1.8	0.3
Pediatric allergy.........................	0.2	0.1	0.4	0.4	0.4	0.3	0.3	0.2
Pediatric cardiology......................	0.2	0.7	0.3	0.7	0.3	0.5	0.3	0.3
Internal medicine subspecialties 1/......	--	--	--	--	--	--	--	--
Surgical specialties......................	40.0	34.6	37.9	33.1	34.9	31.2	32.5	27.[illegible]
General surgery...........................	18.9	19.7	16.5	19.1	14.5	18.8	13.4	16.0
Neurological surgery......................	1.0	0.8	1.1	0.8	1.0	0.3	0.8	0.3
Obstetrics and gynecology.................	5.8	7.1	5.3	7.2	5.7	6.8	5.5	5.5
Ophthalmology.............................	4.3	0.8	4.3	0.6	3.8	0.6	3.5	0.7
Orthopedic surgery........................	4.2	1.6	4.7	1.2	4.2	0.9	4.0	1.2
Otolaryngology............................	2.2	0.5	2.0	0.6	1.7	0.8	1.7	0.8
Plastic surgery...........................	0.6	0.6	0.9	0.6	1.0	0.6	1.1	0.7
Colon and rectal surgery..................	0.1	0.2	0.0	0.2	0.0	0.1	0.1	0.2
Thoracic surgery..........................	0.8	1.4	0.8	1.0	0.8	1.0	0.7	1.0
Urology...................................	2.1	1.9	2.3	1.8	2.2	1.3	1.7	1.5
Other specialties.........................	29.1	32.6	29.2	33.8	28.0	34.7	20.8	37.8
Anesthesiology............................	4.0	6.7	3.3	8.0	2.9	8.6	2.7	6.7
Neurology.................................	2.0	1.6	2.1	1.7	2.4	1.9	1.9	2.1
Pathology.................................	3.9	9.1	3.2	9.6	3.1	8.1	2.9	7.9
Forensic pathology........................	--	--	0.1	0.2	0.1	0.1	0.1	0.1
Psychiatry................................	10.0	9.6	10.3	7.7	9.1	8.0	7.0	11.7
Child psychiatry..........................	1.5	0.6	1.3	1.0	1.6	1.2	1.4	1.9
Physical medicine & rehabilitation.......	0.6	1.4	0.3	1.5	0.4	1.5	0.2	1.8
Radiology.................................	7.1	3.6	7.3	3.8	3.5	3.5	0.7	2.6
Diagnostic radiology......................	--	--	1.0	0.1	4.4	1.1	3.3	1.9
Therapeutic radiology.....................	--	--	0.3	0.2	0.5	0.7	0.5	1.1
Miscellaneous 2/..........................	--	--	--	--	--	--	--	--

Table A-IV-14. First-year residency percent distribution by country of medical education: historical (unadjusted--1967, 1970, 1972 and 1974, historical (adjusted)--1974 and projected (adjusted)--1975 and 1980 (cont)

Specialty	Historical (adjusted)		Projected (adjusted)			
	1974		1975		1980	
	USMG	FMG	USMG	FMG	USMG	FMG
Total active physicians	12,626 100.0	4,735 100.0	100.0 100.0	NA 100.0	NA 100.0	NA 100.0
Primary care	37.5	29.3	40.7	29.3	56.1	32.1
General practice	0.2	2.9	0.2	2.9	0.2	3.1
Family practice	9.0	1.4	10.7	1.6	19.4	2.6
Internal medicine	19.4	13.8	20.5	13.7	25.9	14.6
Pediatrics	9.0	11.2	9.3	11.1	10.6	11.8
Other medical specialties	9.1	5.6	8.9	5.6	6.6	5.9
Dermatology	2.0	0.3	1.9	0.3	1.4	0.3
Pediatric allergy	0.4	0.3	0.4	0.3	0.3	0.3
Pediatric cardiology	0.3	0.4	0.3	0.4	0.2	0.4
Internal medicine subspecialties 1/	6.5	4.6	6.3	4.6	4.7	4.9
Surgical specialties	26.0	19.7	24.7	19.4	19.6	14.5
General surgery	5.4	6.7	[illegible].8	6.4	4.2	1.3
Neurological surgery	0.9	0.3	0.8	0.3	0.5	0.3
Obstetrics and gynecology	5.9	6.1	5.7	6.1	4.3	5.9
Ophthalmology	3.7	0.8	3.6	0.8	2.9	0.8
Orthopedic surgery	4.3	1.3	4.2	1.3	3.1	1.4
Otolaryngology	1.8	0.9	1.7	0.9	1.4	1.0
Plastic surgery	1.2	0.8	1.2	0.8	1.4	0.8
Colon and rectal surgery	0.8	1.1	0.8	1.0	0.6	1.1
Thoracic surgery	0.8	1.1	0.8	1.0	0.6	1.1
Urology	1.8	1.6	1.7	1.6	1.1	1.7
Other specialties	27.4	45.4	25.7	45.7	17.7	47.5
Anesthesiology	2.9	7.3	2.7	6.2	1.6	3.3
Neurology	2.0	2.3	1.9	2.3	1.4	2.4
Pathology	3.1	8.4	3.0	8.3	2.3	8.9
Forensic pathology	0.1	0.1	0.1	0.1	0.1	0.1
Psychiatry	6.1	10.4	5.6	11.3	3.1	13.5
Child psychiatry	1.5	2.1	1.5	2.1	1.1	2.2
Physical medicine and rehabilitation	0.2	2.0	0.2	2.1	0.1	2.4
Radiology	0.7	2.9	0.2	2.7	0.0	1.6
Diagnostic radiology	3.6	2.1	3.5	2.6	2.6	3.5
Therapeutic radiology	0.5	1.2	0.5	1.4	0.4	2.5
Miscellaneous 2/	6.7	6.7	6.5	6.6	5.0	7.1

1/ Includes gastroenterology, pulmonary disease, cardiovascular disease, and allergy.

2/ Includes aerospace medicine, public health, general preventive medicine, occupational medicine, "other", and unspecified.

Source: Directory of Approved Internships and Residencies, AMA, Chicago. Yearly editions.

Table A-IV-15. Actual and projected supply of active M.D.'s by specialty based on trend of first-year residencies: Actual 1974, 1975; Projected 1980 to 1990

Specialty	Number				
	1974 1/	1975 1/	1980	1985	1990
Total active physicians	348,961	364,479	426,350	495,750	564,210
Primary Care	133,588	139,923	168,670	209,220	250,880
General practice	47,566	47,268	39,470	32,440	25,470
Family practice	9,487	11,168	23,230	40,600	58,530
Internal medicine	54,682	58,195	74,390	95,330	116,630
Pediatrics	21,853	23,292	31,580	40,850	50,250
Other medical specialties	18,475	20,360	24,520	29,210	34,000
Dermatology	4,733	4,992	5,820	6,700	7,570
Pediatric allergy	453	477	790	1,060	1,330
Pediatric cardiology	564	576	840	1,020	1,200
Internal medicine subspecialties 2/	12,725	14,315	17,070	20,440	23,900
Surgical specialties	98,672	102,843	113,820	124,770	134,820
General surgery	32,845	33,807	34,990	36,130	36,830
Neurological surgery	3,021	3,134	3,490	3,810	4,070
Obstetrics and gynecology	22,175	23,276	26,070	28,700	31,130
Ophthalmology	11,349	11,920	13,210	14,840	16,470
Orthopedic surgery	11,607	12,188	14,390	16,530	18,560
Otolaryngology	5,904	6,154	6,800	7,610	8,440
Plastic surgery	2,206	2,395	3,460	4,650	5,830
Colon and rectal surgery	699	708	740	740	750
Thoracic surgery	2,034	2,120	2,740	3,240	3,710
Urology	6,832	7,141	7,920	8,520	9,040
Other specialties	98,226	101,353	119,340	132,550	144,520
Anesthesiology	13,191	13,776	15,260	16,070	16,590
Neurology	4,056	4,425	5,840	7,110	8,380
Pathology	12,037	12,553	15,390	17,610	19,700
Forensic pathology	209	214	310	390	470
Psychiatry	24,621	25,623	28,720	30,750	32,610
Child psychiatry	2,547	2,765	4,020	5,060	6,060
Physical medicine and rehabilitation	1,701	1,782	2,140	2,270	2,380
Radiology	12,256	12,347	12,120	11,470	10,570
Diagnostic radiology	3,258	3,796	6,390	8,900	11,010
Therapeutic radiology	1,131	1,252	1,870	2,400	2,920
Miscellaneous 3/	23,219	22,820	27,280	30,520	33,840

1/ 1974 and 1975 figures are actual, and include an estimate of active "not classified" M.D.'s.

2/ Includes allergy, cardiovascular disease, gastroenterology, and pulmonary diseases.

3/ Includes aerospace medicine, occupational medicine, general preventive medicine, public health, unspecified, and "other specialties."

Source: 1974 and 1975 figures from "Distribution of Physicians in the U.S., 1974 and 1975" respectively, G.A. Roback, AMA Chicago, 1975. Trend data on first-year residencies from 1960-1974 issues of "Directory of Approved Internships and Residencies" Ruhe, et al., AMA, Chicago.

NOTE: Subtotals may not add to totals due to independent rounding.

Table A-IV-16. Average number of total patient visits per M.D. per week by type of practice and specialty: 1974

Type of practice	Total 1/	Specialty					
		General practice	Internal medicine	Surgery	Obstetrics/ gynecology	Pediatrics	Psychiatry
Total................	125.8 2/	174.4 3/	126.3 4/	119.6 5/	130.7 6/	152.5 7/	46.7 8/
Solo.........................	119.7	162.8	123.4	111.8	111.8	114.6	44.8
2 man........................	152.1	217.7	114.5	129.7	146.7	165.5	NA
Group:							
3 man......................	135.5	199.2	137.5	123.5	151.9	172.2	84.6 9/
4 man......................	138.7	207.1	96.8	128.6	161.7 9/	174.2 9/	60.9 9/
5-7 man....................	127.0	199.7	137.6	145.1	125.3 9/	163.5 9/	54.0 9/
8-25 man...................	120.6	185.1	142.5	116.1	150.5 9/	145.6 9/	53.8 9/
26 man & over............	117.8	131.1 9/	107.4	140.8	127.5 9/	116.1 9/	NA

1/ Physicians reporting radiology, anesthesiology and other specialties are included in this total column.
2/ Based on 4,479 observations.
3/ Based on 1,040 observations.
4/ Based on 728 observations.
5/ Based on 1,046 observations.
6/ Based on 356 observations.
7/ Based on 292 observations.
8/ Based on 332 observations.
9/ Based on fewer than 30 observations.

Source: Profile of Medical Practice 1975-1976. American Medical Association, Chicago, 1976.

Table A-IV-17. Projected requirements for M.D.'s and D.O.'s in 1980, 1985, and 1990 and comparison with current supply: Project SOAR Model (in thousands)

		Requirements			
	1975 supply	Range of estimates			1975-1990 percent increase range
		1980	1985	1990	
All physicians..............	378.5	424.4-427.4	480.0-491.8	542.6-571.1	43-51
M.D.'s..........................	364.5	408.5-411.5	461.9-473.3	521.9-549.5	43-51
D.O.'s..........................	14.0	15.9	18.1-18.5	20.7-21.6	48-54

Note: These estimates are provisional and subject to revision. The estimates assume that supply and requirements were in balance in 1975; that price elasticity remains constant; that the trends in non-dollar determinants of health care utilization do not substantially change between 1975 and 1990; and that no major care or manpower substitutions occur between manpower types or care categories.

Table A-V-1 . Number of students and graduates of individual dental schools, by State: 1976

State and school	Number of students as of October 15, 1976		Number of graduates 1975-76
	Total	First year	
Total	21,013	5,935	5,336
Alabama			
University of Alabama	275	72	62
California			
University of the Pacific	404	137	125
University of California	347	88	86
University of California at Los Angeles	429	107	101
University of Southern California	508	140	146
Loma Linda University	[illegible]	95	78
Colorado			
University of Colorado	97	25	--
Connecticut			
University of Connecticut	172	52	29
District of Columbia			
Howard University	372	108	98
Georgetown University	584	150	141
Florida			
University of Florida	184	60	22
Georgia			
Emory University	403	105	102
Medical College of Georgia	180	62	66
Illinois			
Loyola University	538	137	126
Northwestern University	410	105	94
Southern Illinois University	130	48	41
University of Illinois	538	133	119
Indiana			
Indiana University	504	129	124
Iowa			
University of Iowa	369	96	77
Kentucky			
University of Kentucky	242	60	63
University of Louisville	332	88	85
Louisiana			
Louisiana State University	369	101	88
Maryland			
University of Maryland	527	137	121
Massachusetts			
Harvard School of Dental Medicine	79	20	18
Boston University	138	42	1
Tufts University	465	160	137

Table A-V-1. Number of students and graduates of individual dental schools, by State: 1976 (cont)

State and school	Number of students as of October 15, 1976		Number of graduates 1975-76
	Total	First year	
Michigan			
University of Detroit	269	85	86
University of Michigan	602	152	135
Minnesota			
University of Minnesota	582	150	126
Mississippi			
University of Mississippi	49	25	--
Missouri			
University of Missouri at Kansas City	633	159	146
Washington University	251	84	116
Nebraska			
Creighton University	296	77	67
University of Nebraska	260	66	62
New Jersey			
Fairleigh Dickinson University	328	83	76
New Jersey Dental School	212	83	62
New York			
Columbia University	216	61	47
New York University	572	207	195
State University of New York at Stony Brook	90	23	--
State University of New York at Buffalo	358	91	90
North Carolina			
University of North Carolina	325	84	80
Ohio			
Ohio State University	587	202	353
Case Western Reserve University	395	106	96
Oklahoma			
University of Oklahoma	153	72	24
Oregon			
University of Oregon	314	82	80
Pennsylvania			
Temple University	572	148	138
University of Pennsylvania	642	162	130
University of Pittsburgh	525	135	121
South Carolina			
Medical University of South Carolina	162	52	51
Tennessee			
Meharry Medical College	175	53	27
University of Tennessee	469	155	180

Table A-V-1. Number of students and graduates of individual dental schools, by State: 1976 (cont)

State and school	Number of students as of October 15, 1976		Number of graduates 1975-76
	Total	First year	
Texas			
Baylor College of Dentistry	391	129	119
University of Texas at Houston	487	124	115
University of Texas at San Antonio	360	151	28
Virginia			
Virginia Commonwealth University	438	110	110
Washington			
University of Washington	390	102	85
West Virginia			
West Virginia University	239	62	55
Wisconsin			
Marquette University	543	137	132
Puerto Rico			
University of Puerto Rico	223	66	54

Source: American Dental Association, Council on Dental Education. *Annual Report on Dental Education, 1976-77*.

Table A-VI-1. Number and percent of total optometrists by age and activity status: 1973

Age group	All optometrists	Activity status				
		Active	Inactive			
			Total	Retired	Unemployed new graduate	Other unemployed
	Number of optometrists					
All ages..........	21,697	19,265	2,432	1,217	60	114
Less than 30.............	1,788	1,698	90	0	50	22
30-39...................	3,159	3,082	77	5	8	12
40-49...................	5,674	5,279	395	27	0	29
50-59...................	6,885	6,236	649	144	0	34
60-69...................	2,655	2,177	478	341	2	14
70 and over..............	1,503	793	710	667	0	3
Unknown..................	33	0	33	33	0	0
	Percent					
All ages..........	100.0	88.8	11.2	5.6	0.3	0.5
Less than 30.............	100.0	95.0	5.0	-	2.8	1.2
30-39...................	100.0	97.6	2.4	0.2	0.3	0.4
40-49...................	100.0	93.0	7.0	0.5	-	0.5
50-59...................	100.0	90.6	9.4	2.1	-	0.5
60-69...................	100.0	82.0	18.0	12.8	0.1	0.5
70 and over..............	100.0	52.8	47.2	44.4	-	0.2

Note: Percents may not add to totals and subtotals due to independent rounding.

Table A-VI-2. Number and percent of active optometrists by racial/ethnic category: 1973

Racial/ethnic category	Number of optometrists	Percent
All categories.........	19,265	100.0
White/Caucasian...............	18,652	96.8
Total minorities..............	480	2.5
Black/Negro...................	105	0.5
Japanese/Chinese..............	288	1.5
Other, Asian..................	9	1/
Indian/Eskimo/Aleut...........	12	0.1
Mexican American..............	37	0.2
Puerto Rican..................	1	1/
Other Latin American..........	10	0.1
All other.....................	18	0.1
Not reported..................	133	0.7

1/ Less than 0.05 percent.

Table A-VI-3. Percent of self-employed optometrists, by form of self-employment and age: 1973

Form of self-employment	All ages	Less than 30	30-39	40-49	50-59	60-69	70 and over
Total..	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Solo practice.	79.9	58.8	70.7	82.5	83.4	83.2	84.7
Partnership...	16.9	34.9	25.0	14.6	13.6	14.4	12.8
Group.........	3.3	6.2	4.3	2.9	3.0	2.5	2.5
Total..	100.0	5.5	15.6	28.9	34.5	11.6	3.8
Solo practice.	100.0	4.0	13.8	29.9	36.1	12.1	4.1
Partnership...	100.0	11.3	23.1	25.0	27.8	9.9	2.9
Group.........	100.0	10.5	20.7	25.7	31.4	8.8	2.9

Note: Percents may not add to 100.0 due to rounding.

Table A-VI-4. Number and percent of active optometrists by principal form of employment: 1973

Principal form of employment	Number of optometrists	Percent
Total	19,265	100.0
Self employed:		
Total	14,896	77.3
Solo practice	11,895	61.7
Partnership	2,514	13.1
Group	487	2.5
Employed:		
Total	3,565	18.5
Federal government--military	405	2.1
Federal government--nonmilitary	32	0.2
State or local government	40	0.2
Professional corporation 1/	798	4.1
Optometrist	1,064	5.5
Ophthalmologist	157	0.8
Physician other than ophthalmologist	16	0.1
Multidisciplinary group practice	174	0.9
Nonprofit organization	369	1.9
Profitmaking firm or manufacturer	430	2.2
All other	80	0.4
Not reported	804	4.2

1/ Established after 1969.

Note: Percents may not add to totals and subtotals due to independent rounding.

Table A-VI-5. Number of active optometrists and optometrist/population ratios, by geographic division and State: December 31, 1973

Division and State	Number of active optometrists	Resident population July 1, 1974 (in 1,000's)	Rate per 100,000 population
United States....	19,265	209,044	9.2
New England.............	1,341	12,145	11.0
Connecticut...........	226	3,080	8.6
Maine.................	124	1,039	11.9
Massachusetts.........	749	5,799	12.9
New Hampshire.........	72	794	9.1
Rhode Island..........	126	967	13.0
Vermont...............	44	466	9.4
Middle Atlantic.........	3,393	37,401	9.1
New Jersey............	675	7,325	9.2
New York..............	1,590	18,214	8.7
Pennsylvania..........	1,128	11,862	9.5
South Atlantic..........	2,204	32,602	6.8
Delaware..............	38	573	6.6
District of Columbia..	68	734	9.3
Florida...............	621	7,745	8.0
Georgia...............	291	4,818	6.0
Maryland..............	210	4,074	5.2
North Carolina........	336	5,302	6.3
South Carolina........	179	2,724	6.6
Virginia..............	326	4,844	6.7
West Virginia.........	135	1,708	7.6
East South Central......	813	13,278	6.1
Alabama...............	101	3,546	5.1
Kentucky..............	225	3,328	6.8
Mississippi...........	124	2,317	5.4
Tennessee.............	363	4,095	8.9
West South Central......	1,489	20,278	7.3
Arkansas..............	163	2,035	8.0
Louisiana.............	225	3,746	6.0
Oklahoma..............	273	2,669	10.2
Texas.................	828	11,828	7.0

Table A-VI-5. Number of active optometrists and optometrist/population ratios, by geographic division and State: December 31, 1973 (cont)

Division and State	Number of active optometrists	Resident population July 1, 1974 (in 1,000's)	Rate per 100,000 population
East North Central.......	4,262	40,822	10.4
Illinois...................	1,569	11,175	14.0
Indiana.................	538	5,304	10.1
Michigan.................	745	9,061	8.2
Ohio.....................	974	10,743	9.1
Wisconsin..............	436	4,539	9.6
West North Central.......	1,654	16,635	9.9
Iowa....................	314	2,863	11.0
Kansas..................	247	2,264	10.9
Minnesota.............	361	3,890	9.3
Missouri...............	422	4,768	8.9
Nebraska..............	149	1,533	9.7
North Dakota...........	74	635	11.7
South Dakota...........	87	682	12.8
Mountain................,	786	9,200	8.5
Arizona.................	149	2,073	7.2
Colorado...............	208	2,468	8.4
Idaho....................	85	776	11.0
Montana................	101	730	13.8
Nevada.................	48	551	8.7
New Mexico.............	80	1,099	7.3
Utah.....................	75	1,150	6.5
Wyoming................	40	353	11.3
Pacific...................	3,203	27,473	11.7
Alaska..................	18	330	5.5
California..............	2,421	20,652	11.7
Hawaii..................	74	841	8.8
Oregon..................	305	2,219	13.7
Washington.............	385	3,431	11.2

Source: DHEW, HRA, BHM. Optometric Manpower Resources, 1973. DHEW Pub. No. 76-101.

Table A-VI-6. Percent distribution of active optometrists by age in each geographic region: 1973

Age group	All regions	Northeast	North Central	South	West
All ages.	100.0	100.0	100.0	100.0	100.0
Less than 30....	8.8	8.5	7.5	10.1	9.6
30-39............	16.0	12.9	13.9	17.7	20.9
40-49............	27.4	27.7	26.7	27.9	27.5
50-59............	32.4	32.2	34.8	31.8	29.7
60-69............	11.3	13.7	12.6	9.1	9.0
70 and over.....	4.1	5.0	4.5	3.4	3.3
All ages.	100.0	25.8	30.7	23.0	20.7
Less than 30....	100.0	24.0	26.2	27.2	22.6
30-39............	100.0	20.0	26.7	26.3	27.1
40-49............	100.0	25.0	30.0	24.2	20.8
50-59............	100.0	24.7	33.0	23.4	19.0
60-69............	100.0	30.1	34.2	19.2	16.4
70 and over.....	100.0	30.1	33.5	19.7	16.6

Note: Percents may not add to 100.0 due to rounding.

Table A-VI-7. Number and percent of active optometrists by school or college of graduation: 1973

School or college	Years of operation	Number of optometrists	Percent
Total.................	--	19,265	100.0
Northern Illinois...........	1926-55	4,077	21.2
Southern....................	1932 to present	2,678	13.9
Pennsylvania................	1919 to present	2,478	12.9
Los Angeles 1/..............	1904 to present	1,525	7.9
Massachusetts...............	1894 to present	1,218	6.3
Illinois....................	1955 to present	1,186	6.2
Ohio State University.......	1914 to present	1,012	5.3
Pacific University..........	1921 to present	999	5.2
Chicago (Monroe)............	1937-55	909	4.7
University of California....	1923 to present	874	4.5
Columbia....................	1910-56	817	4.2
University of Houston.......	1952 to present	433	2.3
Indiana University..........	1951 to present	391	2.0
Rochester...................	1902-36	103	0.5
Needles.....................	1907-26	67	0.4
All other 2/................	--	336	1.7
Not reported................	--	162	0.8

1/ Name was changed in 1975 to Southern California College of Optometry.

2/ Includes 2 Canadian schools.

Sources: Gregg, James R. The Story of Optometry. New York, The Ronald Press Co., 1965. Librarian, American Optometric Association Archives, St. Louis, Missouri.

Table A-VI-8. Number and percent of optometrists active in the same State and in the same geographic region as the school from which graduated: 1973

School or college	Active optometrists	In same State		In same census region	
		Number	Percent	Number	Percent
Los Angeles 1/........	1,525	1,215	79.7	1,410	92.5
Univ of California....	874	751	85.9	801	91.6
Illinois 2/...........	6,219	1,452	23.4	3,916	63.0
Indiana University....	391	207	52.9	282	72.1
Massachusetts.........	1,218	583	47.9	1,094	89.8
Ohio State Univ.......	1,012	612	60.5	710	70.2
Pacific Univ..........	999	253	25.3	797	79.8
Pennsylvania..........	2,478	972	39.2	1,886	76.1
Southern	2,678	309	11.5	2,030	75.8
Univ of Houston.......	433	196	45.3	319	73.7

1/ Name was changed in 1975 to Southern California College of Optometry.

2/ Includes also [illegible]thern Illinois, Chicago (Monroe), and Needles.

Table A-VII-1. Percentage of active pharmacists, by place of practice and racial/ethnic background: 1973

Racial/ethnic group	Place of practice					
	Total	Community pharmacy		Hospital nursing home	Manufacturer	Other
		Independent	Chain			
White	100.0	51.6	26.6	14.0	4.5	3.3
Black	100.0	39.1	27.1	25.7	2.0	6.1
Japanese/Chinese	100.0	32.0	30.9	30.3	1.4	5.4
Other Asian	100.0	25.4	23.7	40.3	5.9	4.7
American Indian/Eskimo/Aleut	100.0	50.0	24.3	12.9	1.4	11.4
All Other	100.0	41.0	27.1	24.1	2.7	5.1

Source: Pharmacy Manpower Information Project, 1973; Unpublished Report, American Association of Colleges of Pharmacy. NIH Contract No. 71-4178.

Table A-VII-2. Number and percent of active male and female pharmacists and pharmacist/population ratios, by geographic division and State: December 31, 1973

Division and State	Number of active pharmacists	Resident population July 1, 1973 (in 1,000's)	Rate per 100,000 population	Number of active male pharmacists	Number of active female pharmacists	Percent	
						Male	Female
United States	116,562	213,155	55	103,732	12,830	89.0	11.0
New England	7,815	12,195	64	7,057	758	90.3	9.7
Connecticut	2,096	3,080	68	1,851	245	88.3	11.7
Maine	409	1,039	39	376	33	91.9	8.1
Massachusetts	4 113	5,779	71	3,774	339	91.8	8.2
New Hampshire	382	794	48	350	32	91.6	8.4
Rhode Island	568	967	59	487	81	85.7	14.3
Vermont	247	466	53	219	28	88.7	11.3
Middle Atlantic	21,422	37,401	57	19,569	1,853	91.4	8.6
New Jersey	4,543	7,325	62	4,172	371	91.8	8.2
New York	10,741	18,214	59	9,927	814	92.4	7.6
Pennsylvania	6,138	11,862	52	5,470	668	89.1	10.9
South Atlantic	16,013	32,692	49	14,282	1,731	89.2	10.8
Delaware	258	573	43	233	25	90.3	9.7
District of Columbia	597	734	81	507	90	84.9	15.1
Florida	3,734	7,745	48	3,352	382	89.8	10.2
Georgia	2,693	4,818	56	2,445	248	90.8	9.2
Maryland	2,015	4,074	49	1,835	180	91.1	8.9
North Carolina	2,289	5,302	43	2,016	273	88.1	11.9
South Carolina	1,391	2,724	51	1,243	148	89.4	10.6
Virginia	2,307	4,844	48	2,011	296	87.2	12.8
West Virginia	729	1,780	41	640	89	87.8	12.2

Table A-VII-2. Number and percent of active male and female pharmacists and pharmacist/population ratios, by geographic division and State: December 31, 1973 (cont)

Division and State	Number of active pharmacists	Resident population July 1, 1973 (in 1,000's)	Rate per 100,000 population	Number of active male pharmacists	Number of active female pharmacists	Percent	
						Male	Female
East South Central	7,043	13,286	53	6,353	690	90.2	9.8
Alabama	1,795	3,546	51	1,597	198	89.0	11.0
Kentucky	1,749	3,320	53	1,595	154	91.2	8.8
Mississippi	1,141	2,317	49	1,033	108	90.5	9.5
Tennessee	2,358	4,095	58	2,128	230	90.2	9.8
West South Central	10,638	20,278	52	9,443	1,195	88.8	11.2
Arkansas	1,110	2,035	55	1,036	74	93.3	6.7
Louisiana	1,923	3,749	51	1,702	221	88.5	11.5
Oklahoma	1,501	2,669	56	1,331	170	88.7	11.3
Texas	6,104	11,828	52	5,374	730	88.0	12.0
East North Central	22,461	40,823	55	19,967	2,494	88.9	11.1
Illinois	6,465	11,176	58	5,823	642	90.1	9.9
Indiana	3,299	5,304	62	2,926	373	88.7	11.3
Michigan	4,744	9,061	52	4,228	516	89.1	10.9
Ohio	5,499	10,743	51	4,811	688	87.5	12.5
Wisconsin	2,454	4,539	54	2,179	275	88.8	11.2
West North Central	9,439	16,635	57	8,491	948	90.0	10.0
Iowa	1,524	2,863	53	1,363	161	89.4	10.6
Kansas	1,304	2,264	58	1,186	118	91.0	9.0
Minnesota	2,114	3,890	54	1,877	237	88.8	11.2
Missouri	2,648	4,768	56	2,436	212	92.0	8.0
Nebraska	1,071	1,533	70	962	109	89.8	10.2
North Dakota	387	635	61	339	48	87.6	12.4
South Dakota	391	682	57	328	63	83.9	16.1

Table A-VII-2. Number and percent of active male and female pharmacists and pharmacist/population ratios, by geographic division and State: December 31, 1973 (cont)

Division and State	Number of active pharmacists	Resident population July 1, 1973 (in 1,000's)	Rate per 100,000 population	Number of active male pharmacists	Number of active female pharmacists	Percent	
						Male	Female
Mountain	5,678	9,200	62	5,045	633	88.8	11.2
Arizona	1,273	2,073	61	1,139	134	89.5	10.5
Colorado	1,640	2,468	66	1,423	217	86.8	13.2
Idaho	473	776	61	412	61	81.1	12.9
Montana	452	730	62	396	56	81.5	12.4
Nevada	311	551	56	924	17	94.5	5.5
New Mexico	683	1,099	62	617	66	90.3	9.7
Utah	608	1,150	53	564	44	92.8	7.2
Wyoming	238	353	67	200	38	84.0	16.0
Pacific	15,066	27,437	55	13,072	1,994	86.8	13.2
Alaska	153	320	46	120	33	78.4	21.6
California	11,025	20,652	53	9,770	1,255	88.6	11.4
Hawaii	246	841	29	197	49	80.1	19.9
Oregon	1,383	2,219	62	1,161	222	84.0	16.0
Washington	2,259	3,431	66	1,824	435	80.7	19.3
Puerto Rico	987	2,951	33	453	534	45.9	54.1
Virgin Islands	--	--	--	--	--	--	--

Source: Active Pharmacists: Unpublished data from NIH Contract No. 71-4178. Pharmacy Manpower Information Project, American Association of Colleges of Pharmacy, 1973.

Population: U.S. Bureau of the Census. Current Population Reports. Series P-25, No. 533. Estimates of the Population of States; 1973. Estimates of the population of Puerto Rico and Outlying Areas; 1960-1973.

Table A-VII.-3. Full-time enrollments in the final three years of professional degree programs in each school of pharmacy: Academic year 1976-77

State and pharmacy school	Total enroll-ment	Total by Sex M	Total by Sex F	Class Year Last year M	Class Year Last year F	Class Year 2nd-last M	Class Year 2nd-last F	Class Year 3rd-last M	Class Year 3rd-last F
All Schools	24,082	15,226	8,856	5,010	2,635	5,247	2,982	4,969	3,239
Alabama									
Auburn University	328	196	132	58	31	68	43	70	58
Samford University	301	217	84	46	12	87	31	84	41
Arizona:									
University of Arizona	219	157	62	54	19	71	21	32	22
Arkansas:									
University of Arkansas	125 1/	85	40	47	16	38	24	-	-
California									
University of California	290	160	130	52	42	58	36	50	52
University of Southern California	437	297	140	97	41	105	38	95	61
University of the Pacific	602 2/	413	189	146	51	130	62	137	76
Colorado:									
University of Colorado	182	115	67	37	15	41	19	37	33
Connecticut:									
University of Connecticut	302	173	129	52	34	68	40	53	55
District of Columbia:									
Howard University	155 2/	77	78	29	30	24	20	24	28
Florida									
Florida A. and M. University	252	149	103	61	40	47	26	41	37
University of Florida	335	195	140	82	34	57	52	56	54
Georgia									
Mercer University	318	220	98	86	31	71	26	63	41
University of Georgia	448	293	155	107	55	83	44	103	56

Table A-VII -3. Full-time enrollments in the final three years of professional degree programs in each school of pharmacy: Academic year 1976-77 (continued)

State and pharmacy school	Total enroll-ment	Total by Sex		Class Year					
				Last year		2nd-last		3rd-last	
		M	F	M	F	M	F	M	F
Idaho:									
Idaho State University	262	209	53	69	15	72	22	68	16
Illinois:									
University of Illinois	479	271	208	117	81	106	77	48	50
Indiana									
Butler University	278	173	105	52	38	72	30	49	37
Purdue University	468	218	250	60	75	81	92	77	83
Iowa									
Drake University	262	169	93	56	27	70	38	43	28
University of Iowa	277	176	101	63	37	72	25	41	39
Kansas:									
University of Kansas	243	163	80	55	20	53	29	55	31
Kentucky:									
University of Kentucky	246	130	116	48	22	43	45	39	49
Louisiana									
Northeast Louisiana University	553	408	145	141	37	147	48	120	60
Xavier University	196	118	78	40	14	35	26	43	38
Maryland:									
University of Maryland	266	144	122	42	36	53	41	49	45
Massachusetts:									
Massachusetts College of Pharmacy	728	507	221	127	64	193	89	187	68
Northeastern University	400	283	117	88	28	86	36	109	53

Table A-VII -3. Full-time enrollments in the final three years of professional degree programs in each school of pharmacy: Academic year 1976-77 (continued)

State and pharmacy school	Total enroll-ment	Total by Sex M	Total by Sex F	Class Year Last year M	Class Year Last year F	Class Year 2nd-last M	Class Year 2nd-last F	Class Year 3rd-last M	Class Year 3rd-last F
Michigan									
Ferris State College	521	390	131	157	40	120	41	113	50
University of Michigan	238	81	157	26	38	32	57	23	62
Wayne State University	306	208	98	44	21	77	37	87	40
Minnesota:									
University of Minnesota	357	226	131	76	47	75	45	75	39
Mississippi:									
University of Mississippi	306	197	109	64	35	62	31	71	43
Missouri									
St. Louis College of Pharmacy	416	283	133	91	57	90	40	102	36
University of Missouri, Kansas City ...	235	139	96	38	35	54	27	47	34
Montana:									
University of Montana	130	82	48	30	11	24	18	28	19
Nebraska									
Creighton University	200	131	69	30	18	56	24	45	27
University of Nebraska	209 3/	127	82	42	20	41	31	44	31
New Jersey:									
Rutgers University	373	220	153	84	39	62	49	74	65
New Mexico:									
University of New Mexico	172	127	45	54	12	38	13	35	20
New York									
Albany College of Pharmacy	332	190	142	56	44	64	47	70	51
Brooklyn College of Pharmacy	523	397	126	125	47	94	35	178	44
St. John's University	676	495	181	140	51	172	67	183	63
SUNY, Buffalo	240	129	111	39	29	39	42	51	40

Table A-VII -3. Full-time enrollments in the final three years of professional degree programs in each school of pharmacy: Academic year 1976-77 (continued)

State and pharmacy school	Total enroll-ment	Total by Sex		Class Year					
				Last year		2nd-last		3rd-last	
		M	F	M	F	M	F	M	F
North Carolina:									
University of North Carolina	405	207	198	78	46	59	85	70	67
North Dakota:									
North Dakota State University	360	258	102	79	30	100	35	79	37
Ohio:									
Ohio Northern University	419	242	177	89	54	85	60	68	63
Ohio State University	384	220	164	68	50	68	63	84	51
University of Cincinnati	219	151	68	61	24	43	16	47	28
University of Toledo	241	177	64	63	17	62	18	52	29
Oklahoma									
Southwestern State College	444	310	134	103	44	104	40	103	50
University of Oklahoma	379	291	88	96	27	117	34	78	27
Oregon:									
Oregon State University	326	232	94	79	22	72	35	81	37
Pennsylvania									
Duquesne University	353	208	145	59	42	79	51	70	52
Philadelphia College of Phar.& Sci...	545	367	178	114	40	129	65	124	73
Temple University	368	251	117	82	41	93	33	76	43
University of Pittsburgh	290	174	116	57	36	56	36	61	44
Rhode Island:									
University of Rhode Island	345	212	133	71	36	64	49	77	48
South Carolina									
Medical University of South Carolina.	180	127	53	32	18	48	22	47	13
University of South Carolina	333	218	115	75	41	86	41	57	33
South Dakota:									
South Dakota State University	211	124	87	42	27	37	30	45	30

Table A-VII -3. Full-time enrollments in the final three years of professional degree programs in each school of pharmacy: Academic year 1976-77 (continued)

State and pharmacy school	Total enroll-ment	Total by Sex M	Total by Sex F	Class Year Last year M	Class Year Last year F	Class Year 2nd-last M	Class Year 2nd-last F	Class Year 3rd-last M	Class Year 3rd-last F
Tennessee:									
University of Tennessee	335	167	168	69	50	58	65	40	53
Texas									
Texas Southern University	274	172	102	56	23	74	46	42	33
University of Houston	471	325	146	80	28	105	54	140	64
University of Texas	530	307	223	105	58	127	77	75	88
Utah:									
University of Utah	211	171	40	50	10	60	11	61	19
Virginia:									
Virginia Commonwealth University	279	147	132	51	38	50	44	46	50
Washington									
University of Washington	258	138	120	41	45	44	40	53	35
Washington State University	190	125	65	32	20	49	22	44	23
West Virginia;									
West Virginia University	208	118	90	37	29	39	31	42	30
Wisconsin:									
University of Wisconsin	527	352	175	115	51	108	61	129	63
Wyoming:									
University of Wyoming	192	147	45	55	24	60	11	32	10
Puerto Rico:									
University of Puerto Rico	617	149	468	62	175	40	122	47	171

1/ Arkansas offers an accelerated program; the two years reported are equivalent to three academic (nine month) years

2/ Pacific and Howard offer accelerated programs; the three years reported are equivalent to four academic (nine month) years.

3/ Nebraska is terminating the B.S. Pharmacy program, and now accepts students for the Pharm.D. program only.

Source: Enrollment Report on Professional Degree Programs in Pharmacy, Fall 1976. American Association of Colleges of Pharmacy, Bethesda, Maryland

Table A-VIII-1. Number and percent of active podiatrists by age and sex: 1974

Age group	Number			Percent distribution		
	Total	Male	Female	Total	Male	Female
All ages....	7,120	6,848	272	100.0	100.0	100.0
Under 35 years.....	1,300	1,288	12	18.2	18.8	4.4
35-44 years......	1,160	1,149	11	16.3	16.8	4.0
45-54 years......	1,902	1,827	75	26.7	26.7	27.6
55-64 years......	1,880	1,774	106	26.4	25.9	39.0
65 years and over..	878	810	68	12.3	11.8	25.0

Table A-VIII-2. Number and percent of active podiatrists by principal form of employment: 1974

Principal form of employment	Number of podiatrists	Percent
Total.................	7,120	100.0
Self-employed 1/...........	6,836	96.0
Solo practice.............	5,719	80.0
Partnership practice.....	950	13.3
Group practice...........	167	23.4
Salaried 1/.................	237	3.3
Government organizations 2/.......	120	1.7
Non-government organizations 3/.......	117	1.6
Other 1/....................	12	0.2

1/ Excludes 36 active podiatrists not providing patient care who were not asked to report their principal form of employment.

2/ Includes military, federal (non-military), State and local.

3/ Includes prepaid group health plan other non-governmental organizations and other podiatrists.

Table A-VIII-3. Number of active podiatrists and podiatrist/population ratios, by geographic division and State: December 31, 1974

Division and State	Number of active podiatrists	Resident population July 1, 1974 (in 1,000's)	Rate per 100,000 population
United States.....	7,085	211,391	3.4
New England..............	621	12,148	5.1
Connecticut............	173	3,086	3.1
Maine..................	18	1,049	1.7
Massachusetts..........	347	5,799	6.0
New Hampshire..........	23	808	2.8
Rhode Island...........	53	938	5.6
Vermont................	7	468	1.5
Middle Atlantic..........	2,255	37,264	6.0
New Jersey.............	355	7,322	4.8
New York...............	1,226	18,101	6.8
Pennsylvania...........	674	11,841	5.7
South Atlantic...........	701	33,208	2.1
Delaware...............	18	577	3.1
District of Columbia...	51	721	7.1
Florida................	248	8,099	3.1
Georgia................	70	4,877	1.4
Maryland...............	131	4,089	3.2
North Carolina.........	55	5,375	1.0
South Carolina.........	17	2,775	0.6
Virginia...............	73	4,910	1.5
West Virginia..........	39	1,784	2.2
East South Central.......	119	13,412	0.9
Alabama................	19	3,575	0.5
Kentucky...............	52	3,354	1.6
Mississippi............	9	2,334	0.4
Tennessee..............	40	4,149	1.0
West South Central.......	315	20,529	1.5
Arkansas...............	20	2,068	1.0
Louisiana..............	36	3,767	1.0
Oklahoma...............	51	2,681	1.9
Texas..................	208	12,017	1.7

Table A-VIII-3. Number of active podiatrists and podiatrist/population ratios, by geographic division and State: December 31, 1974 (cont)

Division and State	Number of active podiatrists	Resident population July 1, 1974 (in 1,000's)	Rate per 100,000 population
East North Central	1,636	40,902	4.0
Illinois	570	11,160	5.1
Indiana	128	5,313	2.4
Michigan	296	9,117	3.2
Ohio	515	10,745	4.8
Wisconsin	126	4,566	2.8
West North Central	333	16,657	2.0
Iowa	84	2,857	2.9
Kansas	42	2,266	1.8
Minnesota	70	3,905	1.8
Missouri	82	4,772	1.7
Nebraska	37	1,541	2.4
North Dakota	5	636	0.8
South Dakota	12	681	1.8
Mountain	229	9,440	2.4
Arizona	55	2,160	2.5
Colorado	64	2,515	2.5
Idaho	15	796	1.9
Montana	14	737	1.9
Nevada	15	574	2.6
New Mexico	27	1,119	2.4
Utah	32	1,179	2.7
Wyoming	7	302	1.9
Pacific	877	27,821	3.2
Alaska	3	344	0.9
California	764	20,876	3.7
Hawaii	8	854	0.9
Oregon	37	2,255	1.6
Washington	66	3,494	1.9

Source: Based on data in NCHS, Monthly Vital Statistics Report, Preliminary data from the Survey of Podiatrists, U.S., 1974.

Population: U.S. Bureau of the Census Population Reports, Series P-25, No. 615.

Note: Figures may not add to totals and subtotals due to independent rounding.

Table A-VIII-4. Enrollment and graduates in colleges of podiatric medicine: 1976-77

	Total enrollment	Year of graduation				Graduates
		1980	1979	1978	1977	(1976)
Total: all schools.....	2,295	650	609	545	491	496
California College of Podiatric Medicine.....	378	91	108	99	80	145
Illinois College of Podiatric Medicine.....	609	171	149	157	132	113
New York College of Podiatric Medicine.....	350	112	106	71	61	59
Ohio College of Podiatric Medicine.....	512	148	128	114	122	112
Pennsylvania College of Podiatric Medicine.....	446	128	118	104	96	67

Source: American Association of Colleges of Podiatric Medicine.

Table A-VIII-5. Colleges of podiatric medicine, students, and graduates: selected years, 1960-61 through 1974-75

Academic year	Colleges	Students		Graduates
		Total	First-year	
1976-77..............	5	2,295	650	-
1975-76..............	5	2,085	642	496
1974-75..............	5	1,837	561	352
1973-74..............	5	1,631	551	305
1972-73..............	5	1,401	473	269
1971-72..............	5	1,267	399	286
1970-71..............	5	1,148	351	242
1969-70..............	5	1,097	293	251
1968-69..............	5	1,061	331	204
1967-68..............	5	924	291	162
1966-67..............	5	838	283	165
1964-65..............	5	622	177	122
1962-63..............	4	496	151	114
1960-61..............	5	478	107	116
1855-56..............	6	700	NA	142
1951-52..............	8	1,633	NA	478

Source: American Association of Colleges of Podiatric Medicine.

Table A-IX-1. Schools of veterinary medicine and number of students and graduates: 1964-65 through 1976-77

Year	Schools	Students		Graduates
		Total	First year	
1976-77	21	6,571	1,856	1,599
1975-76	19	6,274	1,702	1,523
1974-75	19	6,005	1,682	1,409
1973-74	19	5,720	1,630	1,388
1972-73	18	5,439	1,580	1,280
1971-72	18	5,149	1,453	1,258
1970-71	18	5,006	1,430	1,239
1969-70	18	4,876	1,339	1,165
1968-69	18	4,779	1,311	1,129
1967-68	18	4,623	1,315	1,064
1966-67	18	4,388	1,305	963
1965-66	18	4,119	1,242	916
1964-65	18	3,864	1,139	874

Source: Journal of the American Veterinary Medical Association. March 1, 1977 and prior annual issues.

Table A-IX-2. Projection of first-year enrollments in U.S. schools of veterinary medicine: academic years 1977-78 through 1987-88

Projection series	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82
Low Series:	1,856 1/	1,936	2,025	2,138	2,165	2,190
Includes:						
(1) Growth in 78-79 as mandated by P.L. 94-484						
(2) Three new schools						
(3) Increase at U. of Calif. in 79-80						
(4) No autonomous growth						
Basic Series:						
Total	1,856	1,936	2,025	2,160	2,209	2,296
Total low series	1,856	1,936	2,025	2,138	2,165	2,190
Additional new schools (2)	--	--	--	--	--	40
Autonomous growth (1%)	--	--	--	22	44	66
High Series:						
Total	1,856	1,936	2,025	2,177	2,243	2,347
Total low series	1,856	1,936	2,025	2,138	2,165	2,190
Additional new schools (3)	--	--	--	--	--	40
Autonomous growth (1.8%)	--	--	--	--	--	117

Table A-IX-2. Projection of first-year enrollments in U.S. schools of veterinary medicine: academic years 1977-78 through 1987-88
(cont)

Projection series	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88
Low Series:	2,220	2,220	2,220	2,220	2,220	2,220
Includes: (1) Growth in 78-79 as mandated by P.L. 94-484 (2) Three new schools (3) Increase at U. of Calif. in 79-80 (4) No autonomous growth						
Basic Series						
Total	2,403	2,465	2,512	2,534	2,556	2,578
Total low series	2,220	2,220	2,220	2,220	2,220	2,220
Additional new schools (2)	95	135	160	160	160	160
Autonomous growth (1%)	88	110	132	154	176	198
High Series:						
Total	2,471	2,550	2,654	2,708	2,772	2,811
Total low series	2,220	2,220	2,220	2,220	2,220	2,220
Additional new schools (3)	95	135	200	215	240	240
Autonomous growth (1.8%)	156	195	234	273	312	351

1/ Base year, actual number.

Source: Journal of the American Veterinary Medical Association. Vol. 170, No. 5, March 1. 1977.

Table A-IX-3. Geographic distribution of entering class of veterinary students in the U.S. schools: academic year, 1976-77

Residence	Universities						
	Total	Auburn	California	Colorado St.	Cornell	Florida	Georgia
Total first year	1,856	115	94	125	75	40	86
Alabama	56	50	--	--	--	--	--
Alaska	2	--	--	1	--	--	--
Arizona	16	--	--	10	--	--	--
Arkansas	24	--	--	--	--	--	--
California	92	--	92	--	--	--	--
Colorado	70	--	--	69	1	--	--
Connecticut	8	--	--	--	1	--	--
Delaware	1	--	--	--	--	--	--
District of Columbia	2	--	--	--	--	--	--
Florida	41	--	--	--	--	40	--
Georgia	41	--	--	--	--	--	39
Hawaii	7	--	--	--	--	--	--
Idaho	13	--	--	1	--	--	--
Illinois	77	--	--	--	--	--	--
Indiana	57	--	--	--	--	--	--
Iowa	91	--	--	--	--	--	--
Kansas	76	--	--	--	--	--	--
Kentucky	32	24	--	--	--	--	--
Louisiana	56	--	--	--	--	--	--
Maine	4	--	--	--	1	--	--
Maryland	25	--	--	--	--	--	16
Massachusetts	13	--	--	--	3	--	--
Michigan	113	--	--	--	--	--	--
Minnesota	54	--	--	--	--	--	--
Mississippi	22	15	--	--	--	--	--
Missouri	66	--	--	--	--	--	--
Montana	10	--	--	9	--	--	--
Nebraska	21	--	--	--	--	--	--
Nevada	8	--	1	4	--	--	--
New Hampshire	5	--	--	--	--	--	--
New Jersey	29	--	--	--	4	--	--
New York	58	--	--	--	58	--	--
New Mexico	11	--	1	5	--	--	--
North Carolina	35	26	--	--	--	--	--
North Dakota	14	--	--	--	--	--	--
Ohio	105	--	--	--	2	--	--
Oklahoma	60	--	--	--	--	--	--
Oregon	10	--	--	2	--	--	--
Pennsylvania	73	--	--	--	1	--	--
Rhode Island	4	--	--	--	1	--	--

Table A-IX-3. Geographic distribution of entering class of veterinary students in the U.S. schools: academic year, 1976-77 (cont)

Residence	Total	Auburn	California	Colorado St.	Cornell	Florida	Georgia
	Universities						
South Carolina..................	14	--	--	--	--	--	12
South Dakota.....................	8	--	--	--	--	--	--
Tennessee........................	43	--	--	--	1	--	--
Texas............................	139	--	--	--	--	--	--
Utah.............................	15	--	--	13	--	--	--
Virginia.........................	29	--	--	--	--	--	19
Vermont..........................	4	--	--	--	2	--	--
Washington.......................	47	--	--	--	--	--	--
West Virginia....................	11	--	--	--	--	--	--
Wisconsin........................	17	--	--	--	--	--	--
Wyoming..........................	14	--	--	11	--	--	--
Puerto Rico......................	5	--	--	--	--	--	--
Virgin Islands...................	2	--	--	--	--	--	--
Foreign Countries................	4	--	--	--	--	--	--
Percent admitted from States without schools of veterinary medicine........................		57	2	45	23	8	55

Table A-IX-3. Geographic distribution of entering class of veterinary students in the U.S. schools: academic year: 1976-77 (cont)

Residence	Universities						
	Illinois	Iowa St.	Kansas St.	Louisiana St.	Michigan St.	Minnesota	Missouri
Total first year..	75	121	101	80	115	80	72
Alabama	--	--	--	--	--	--	--
Alaska	--	--	--	--	--	--	--
Arizona	--	--	1	--	--	1	--
Arkansas	--	--	2	15	--	--	2
California	--	--	--	--	--	--	--
Colorado	--	--	-	--	--	--	--
Connecticut	--	1	--	--	--	--	--
Delaware	--	--	--	--	--	--	--
District of Columbia	--	--	--	--	--	--	--
Florida	--	--	--	--	1	--	--
Georgia	--	--	--	--	--	--	--
Hawaii	--	--	1	--	--	--	--
Idaho	--	--	--	--	--	--	--
Illinois	76	1	--	--	--	--	--
Indiana	--	--	--	--	--	--	--
Iowa	--	91	--	--	--	--	--
Kansas	--	--	76	--	--	--	--
Kentucky	--	--	--	--	--	--	1
Louisiana	--	--	--	56	--	--	--
Maine	--	--	--	--	--	--	--
Maryland	--	--	--	--	--	--	--
Massachusetts	--	2	--	--	--	--	--
Michigan	--	--	--	--	113	--	--
Minnesota	--	--	--	--	--	54	--
Mississippi	--	--	--	5	--	--	--
Missouri	--	--	--	--	--	--	66
Montana	--	--	--	--	--	--	--
Nebraska	--	10	4	--	--	3	2
Nevada	--	--	1	--	--	--	--
New Hampshire	--	--	--	--	--	--	--
New Jersey	--	--	2	--	1	--	--
New York	--	--	--	--	--	--	--
New Mexico	--	--	1	--	--	--	--
North Carolina	--	--	--	--	--	--	--
North Dakota	--	6	2	--	--	5	--
Ohio	--	--	--	--	--	--	--
Oklahoma	--	--	--	--	--	--	--
Oregon	--	3	2	--	--	--	--
Pennsylvania	--	--	--	--	--	--	--
Rhode Island	--	1	--	--	--	--	--

Table A-IX-3. Geographic distribution of entering class of veterinary students in the U.S. schools: academic year: 1976-77 (cont)

Residence	Universities						
	Illinois	Iowa St.	Kansas St.	Louisiana St.	Michigan St.	Minnesota	Missouri
South Carolina............	--	--	--	--	--	--	--
South Dakota.............	--	6	2	--	--	--	--
Tennessee................	--	--	--	--	--	--	--
Texas....................	--	--	--	--	--	--	--
Utah.....................	--	--	2	--	--	--	--
Virginia.................	--	--	--	--	--	--	--
Vermont..................	--	--	--	--	--	--	--
Washington...............	--	--	--	--	--	--	--
West Virginia............	--	--	--	4	--	--	--
Wisconsin................	--	--	--	--	--	17	--
Wyoming..................	--	--	3	--	--	--	--
Puerto Rico..............	--	--	2	--	--	--	--
Virgin Island............	--	--	--	--	--	--	1
Foreign Countries........	--	--	--	--	--	--	--
Percent admitted from States without schools of veterinary medicine......	0	25	25	30	2	30	8

Table A-IX-3. Geographic distribution of entering class of veterinary students in the U.S. schools: academic year: 1976-77 (cont)

Residence	Universities							
	Ohio St.	Oklahoma St.	Pennsylvania	Purdue	Tennessee	Texas A&M	Tuskegee	Washington
Total first year..	131	66	104	72	40	138	45	80
Alabama	--	--	--	--	--	--	8	--
Alaska	--	--	--	--	--	--	--	1
Arizona	--	--	--	--	--	--	--	4
Arkansas	--	3	--	--	--	--	2	--
California	--	--	--	--	--	--	--	--
Colorado	--	--	--	--	--	--	--	--
Connecticut	--	--	3	3	--	--	--	--
Delaware	--	--	1	--	--	--	--	--
District of Columbia	--	--	--	--	--	--	2	--
Florida	--	--	--	--	--	--	--	--
Georgia	--	--	--	--	--	--	2	--
Hawaii	--	--	--	--	--	--	--	5
Idaho	--	--	--	--	--	--	--	13
Illinois	--	--	--	--	--	--	--	--
Indiana	--	--	--	57	--	--	--	--
Iowa	--	--	--	--	--	--	--	--
Kansas	--	--	--	--	--	--	--	--
Kentucky	5	--	--	1	--	--	1	--
Louisiana	--	--	--	--	--	--	--	--
Maine	--	--	3	--	--	--	--	--
Maryland	4	--	--	1	--	--	4	--
Massachusetts	--	--	5	3	--	--	--	--
Michigan	--	--	--	--	--	--	--	--
Minnesota	--	--	--	--	--	--	--	--
Mississippi	--	--	--	--	--	--	2	--
Missouri	--	--	--	--	--	--	--	--
Montana	--	--	--	--	--	--	--	1
Nebraska	--	2	--	--	--	--	--	--
Nevada	--	--	--	--	--	--	--	2
New Hampshire	3	--	2	--	--	--	--	--
New Jersey	6	--	15	1	--	--	--	--
New York	--	--	--	--	--	--	--	--
New Mexico	--	--	--	--	--	--	--	4
North Carolina	4	--	--	--	--	--	5	--
North Dakota	--	1	--	--	--	--	--	--
Ohio	102	--	--	--	--	--	1	--
Oklahoma	--	60	--	--	--	--	--	--
Oregon	--	--	--	--	--	--	--	3
Pennsylvania	--	--	71	--	--	--	1	--
Rhode Island	--	--	2	--	--	--	--	--

Table A-IX-3. Geographic distribution of entering class of veterinary students in the U.S. schools: academic year: 1976-77 (cont)

Residence	Ohio St.	Oklahoma St.	Pennsylvania	Purdue	Tennessee	Texas A&M	Tuskegee	Washington
South Carolina............	--	--	--	--	--	--	2	--
South Dakota............	--	--	--	--	--	--	--	--
Tennessee................	--	--	--	--	40	--	2	--
Texas....................	--	--	--	--	--	138	1	--
Utah.....................	--	--	--	--	--	--	--	--
Virginia.................	5	--	--	--	--	--	5	--
Vermont..................	--	--	2	--	--	--	--	--
Washington...............	--	--	--	--	--	--	--	47
West Virginia............	2	--	--	4	--	--	1	--
Wisconsin................	--	--	--	--	--	--	--	--
Wyoming..................	--	--	--	--	--	--	--	--
Puerto Rico..............	--	--	--	1	--	--	2	--
Virgin Islands...........	--	--	--	1	--	--	--	--
Foreign Countries........	--	--	--	--	--	--	4	--
Percent admitted from States without schools of veterinary medicine......	22	9	32	21	0	0	76	41

Source: Journal of the American Veterinary Medical Association, Vol. 170, No. 5, March, 1977.

Table A-IX-4. Number of active veterinarians and veterinarian/population ratios, by geographic division and State: 1975

Division and State	Number of active veterinarians	Resident population July 1, 1974 (in 1,000's)	Rate per 100,000 population
United States....	31,059	213,033	14.6
New England............	1,288	12,169	10.5
Connecticut..........	322	3,100	10.4
Maine................	141	1,058	13.3
Massachusetts........	505	5,814	8.6
New Hampshire........	134	812	16.5
Rhode Island.........	69	913	7.5
Vermont..............	117	472	24.7
Middle Atlantic..........	3,532	37,269	9.4
New Jersey...........	700	7,333	9.5
New York.............	1,673	18,076	9.2
Pennsylvania.........	1,159	11,860	9.7
South Atlantic...........	4,434	33,658	13.1
Delaware.............	73	579	12.6
District of Columbia..	70	712	9.8
Florida..............	1,195	8,277	14.4
Georgia..............	728	4,931	14.7
Maryland.............	798	4,122	19.3
North Carolina.......	531	5,441	9.7
South Carolina.......	249	2,816	8.8
Virginia.............	673	4,981	13.5
West Virginia........	117	1,799	6.5
East South Central......	1,667	13,516	12.3
Alabama..............	524	3,615	14.5
Kentucky.............	440	3,387	13.0
Mississippi..........	260	2,341	11.1
Tennessee............	443	4,173	10.6
West South Central......	3,353	20,868	16.0
Arkansas.............	280	2,110	13.2
Louisiana............	421	3,806	11.0
Oklahoma.............	557	2,715	20.5
Texas................	2,095	12,237	17.2

Table A-IX-4. Number of active veterinarians and veterinarian/population ratios, by geographic division and State: 1975 (cont)

Division and State	Number of active veterinarians	Resident population July 1, 1974 (in 1,000's)	Rate per 100,000 population
East North Central......	5,709	40,945	14.0
Illinois..............	1,457	11,197	13.0
Indiana................	883	5,313	16.6
Michigan...............	1,188	9,111	13.0
Ohio...................	1,407	10,735	13.1
Wisconsin..............	774	4,589	16.8
West North Central......	4,554	16,691	27.3
Iowa...................	1,238	2,861	43.2
Kansas.................	695	2,280	30.4
Minnesota..............	900	3,921	22.9
Missouri...............	872	4,767	18.3
Nebraska...............	493	1,544	31.9
North Dakota...........	117	637	18.3
South Dakota...........	239	681	35.1
Mountain................	2,170	9,643	22.5
Arizona................	358	2,212	16.2
Colorado...............	773	2,541	30.4
Idaho..................	219	813	26.3
Montana................	241	746	32.3
Nevada.................	106	590	17.9
Utah...................	158	1,203	12.9
Wyoming................	118	376	31.4
Pacific.................	4,352	28,274	15.4
Alaska.................	50	365	13.7
California.............	3,082	21,198	14.5
Hawaii.................	80	868	9.2
Oregon.................	425	2,284	18.6
Washington.............	715	3,559	20.1

Source: Based on data from the American Veterinary Medical Association.

APPENDIX B

Methodology and Detailed
Requirements Estimates

APPENDIX B

Methodology and Detailed Requirements Estimates

The health manpower requirements projections presented earlier in this report were made using the Project SOAR requirements model developed by the Manpower Analysis Branch, Bureau of Health Manpower. This Appendix provides a technical overview of the modelling methodology, and describes some major potential developments that may substantially influence the present health care delivery system. Finally, this Appendix provides a summary of approaches and findings from studies that attempt to measure current imbalances in supply and requirements for physicians.

The current first generation general requirements model, termed the "SOAR" model, was originally developed as part of Project SOAR (Supply Output and Requirements), and represents an initial effort to provide decision makers, analysts, and planners with rationally derived data for formulating policy decisions, legislative proposals, and program options. The model was conceived to respond to the question, "How much manpower will be required by the future health care system under certain specific conditions?" The developers selected a demographic projection method as the most straightforward way to respond to immediate questions on future manpower requirements. Using this method, the SOAR requirements model projects U.S. population by age, sex, and income subgroup to 1980, 1985 and 1990. For each population subgroup, a utilization rate for each of 18 types of health service setting (e.g., general medical office visit, inpatient hospital admission, nursing home stay, etc.), was estimated from recent National Health Interview Survey data and other sources. Although projections of the total population's utilization of specific types of care are obtained by cross-multiplying the projected size of each population subgroup by its associated utilization rate, these specialty-oriented estimates will not be presented until additional work is done on these important parameters of the model.

The foregoing procedure describes the first stage or "framework" phase of the model. In the second stage, the model incorporates changes in utilization which largely represent a continuation of recent trends in the delivery of care. In an effort to avoid the problems of trend models, as discussed elsewhere in the report (see Chapter 3), the model introduces adjustments for past changes in consumer prices for various health services, coupled with changes in per capita utilization. These modifications to the "fixed coefficient" model are computed by first making linear extrapolations of per capita utilization trends for particular health services, after adjusting for price change. Specifically, a "nondollar" utilization trend is computed for each health service setting considered in the model by removing the effects of changes in consumer price from throughout the historic per-capita utilization trend. 1/ Consumer price is defined as the cross-product of average coinsurance for a particular health service category, and the Consumer Price Index (CPI) for that health service adjusted by the CPI for all items. This "nondollar" per capita utilization trend is then projected, using linear regression techniques, to each of the target years 1980, 1985, and 1990. The adjusted CPI and average coinsurance are independently projected as linear extrapolations, and future average per capita utilization rates recomputed for each of the target years. Alternative requirements estimates, where shown, represent different choices of price elasticity of demand coefficients, that is, alternative rates of consumer responsiveness to price change for a given personal health service are assumed in the model. The reader should be aware, however, that the alternate requirements estimates were not developed to represent the extreme values that the model's parameters might assume. The values chosen for elasticities are inclined to be conservative, and no deviations from recent price trends are assumed, except in instances where price is deliberately held constant for analytical purposes. The parameter values used,

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1/ The equation for obtaining the "nondollar" trend line, alpha, is:

`alpha = U/(PI)**B;`

Future utilization (U') is thus computed as:

`U' = alpha * (PI)**B`

Where U = historic utilization per person; P = provider price; I = average coinsurance; and B, the exponent, = price elasticity of demand, which is always negative.

The alternate elasticity coefficients used in the equations are: -0.14 and -0.30 for medical office services; -0.08 and -0.20 for short-term hospital services; -0.16 and -1.00 for dental office services; -0.07 and no alternate for pharmacy services. The utilization adjustment for nursing home service is from Chiswick, B.R. The Demand for Nursing Home Care: An Analysis of the Substitution Between Institutional and Noninstitutional Care. <u>The Journal of Human Resources</u>, Vol. XI, No. 3, 1976, pp. 295-316.

though, were chosen to represent a consensus of estimates from recent studies from the health econometrics literature and the most recently available data from the Social Security Administration, the National Center for Health Statistics, the Bureau of Labor Statistics, and other sources.

It is important to note that the "nondollar" utilization trend represents a component of utilization which measures all determinants of utilization not accounted for by price. The trend is not necessarily a pure or even a predominant measure of any single influence. Patient-care physician supply, for example, can account for only about 30 percent of the variance in nondollar- related utilization of medical office services. Although no effort was undertaken to statistically factor the trend into its constituent parts, it is expected that such factors as morbidity, health status, education, regional and environmental differences, and availability of health facilities and resources, to name but a few, would also prove to be underlying correlates. While any inhibition of demand because of supply contraints could not be determined (which, if controlled for, would more closely identify demand defined as the consumer's willingness and ability to purchase care), the model can partially gauge the probable effects of demand suppression through price rationing by assuming a constant provider price throughout the projection period.

In order to convert estimates of total utilization of health services into reqirements for health manpower, the number of manpower observed to be associated with each of the 18 care types in the 1975 base year was multiplied by the ratio of estimated utilization in each target year to utilization observed as baseline. After minor arithmetic manipulation, including the introduction of the price trend adjustments, the desired projections of manpower requirements emerge.

In evaluating this methodology, several general qualifications must be made. First, the concept of requirements used here essentially reflects a projection of the current (1975) utilization of health care by segments of the population, rather than the medical "need" for health care. Second, the estimates are based on the relationship of health manpower to the health service provided--to the extent that the services provided or utilized in the base year are less than those actually "required" or "demanded", the estimates of future manpower requirements will understate the real demand for health manpower and, therefore, actual requirements for health manpower. Moreover, the per capita demand estimates generated for the future assume no feedback from projected supply increases. To the extent that increases in supply lower or raise the price of services and, therefore affect demand, the analysis is lacking. Also, to the extent that the supply of providers increases the per capita demand for services, the requirements estimates would be biased downwards.

To facilitate comparisons, Table B-1 displays gross health manpower requirements estimates for years 1980, 1985, and 1990, and supply estimates for these years for selected health manpower categories. Table B-2 shows predicted requirements and supply comparisons for physicians. The particular rationale for these requirements projections are considered in the chapters devoted to the individual disciplines. In general, all requirements estimates reflect changes in the demographic structure of the population, and an adjustment for changes in per capita utilization of the respective health services.

The primary requirements estimates for dentists have been made by the Division of Dentistry, BHM, and appear in the chapter on dentists. The SOAB general model was used to project requirements for dental services, and while results are not presented, the estimates were sufficiently similar to allow the same conclusions about changes in requirements versus supply (See Chapter 5 for discussion).

These projections offer an approximate insight into what the balance of supply and requirements for selected health practitioners may be in future years. The numbers presented here are to be viewed as gross estimates, figures that are still in the preliminary stages of evaluation and analysis and which are subject to change. As such, simplistic comparisons of supply and requirements may be somewhat premature in their implications for decision-making activities and further analytic efforts.

As has been stated, one set of requirements estimates (not tabulated) is based on constant service fees throughout the projection period. With fees held at their 1975 levels, the model projects physician requirements in 1990 to increase only 3 to 6 percent over what the model forecasts for 1990 when service fees are allowed to vary. In part, such a small differences are attributable to the conservative price elasticities assumed in the model, but the estimates are probably not unrealistic in view of the modest increases in real dollar physician office fees observed in recent years. When the average real dollar price of prescription drugs is fixed at the 1975 CPI level, 1990 requirements for pharmacists actually rise by about 5 percent, since the prescription drugs price trend has been downward for the last several years. While hospital costs are rising, the influence on physician and pharmacy manpower requirements is not large because of the comparatively fewer numbers working predominately in that setting.

References have been made to major contingencies that may substantially affect the health care delivery system. There are a number of these developments that are important and could materially alter the requirements forecasts made in this report, but are not taken into account in the projections prescribed. National Health Insurance, expanded roles for midlevel health practitioners (nurse practitioners, physician assistants, and expanded function dental auxiliaries), Health Maintenance Organizations, and technological advances are potentially major sources of future changes in the health care system. Of these, probably the most critical are impending changes in the financial structuring of the health care system through enactment of some form of National Health Insurance. The critical elements in any NHI proposal are the level of benefits offered and the level of cost-sharing imposed on enrollees. For analytical purposes, two archtypal NHI plans were considered. The archtypal plans were formulated to cover medical office services, short-term hospital, medical, surgical and outpatient benefits, pharmacy services, nursing home care, and dental services for children age 14 and under. With average coinsurance set at 15 percent, such a plan instituted in 1980 is estimated to increase overall requirements for physicians in 1980 by 7 to 10 percent if it is assumed that no reduction in short-term hospital utilization occurs because of increases in average coinsurance. Requirements for pharmacists would rise substantially because of the high average coinsurance for pharmaceuticals predicted to be in effect in 1980.

If average coinsurance in the NHI archtypal plan is set at 25 percent, practically no increase is foreseen in physician requirements over that forecast for physicians in 1980 in the absence of NHI, although pharmacist requirements in 1980 are estimated to increase markedly under such an NHI plan. Clearly, though, these are crude estimates made without refinements for the multitude of other variables which would act to temper health manpower requirements in the event of National Health Insurance. They are merely offered to point out the extent of difference in the price-adjusted requirements estimates that reduced net consumer cost may make, such as might come about through NHI. 1/

Preliminary analyses have also been undertaken to assess the effects of future employment of expanded function aides. The result of this analysis indicate nearly negligible effects on physician requirements--decreases by 1990 on the order of 2-3 percent. This result is a function of the limited supply of aides which have been forecast; it does not imply that there are no significant positive returns in increased productivity through employment of aides, only that so few aides are expected to be available to a proportionately large number of physicians.

Finally, growth in HMO coverage has been considered, but presentation of results must await reevaluation of some of the model's data on HMO's. Estimates are expected to be available in later reports.

Alternative Requirements Methodologies and Estimates

In addition to the Project SOAR effort, the Bureau of Health Manpower has undertaken development of other methods and approaches to determining manpower requirements and supply that together will permit forecasting of requirements/supply balances under various future scenarios. As a result of a recent Bureau-sponsored literature surveillance, a report 2/ was recently published which provides detailed reviews of a large number of requirements studies reported in the literature. These studies used many different assumptions and methods in order to establish "standards" for requirements. All were done in the past decade and most since 1970. The remainder of this Appendix briefly compares supply to recommended requirements standards from some of these various studies, in order to view the ranges of requirements estimates when nonuniform assumptions, definitions and methods used. These estimates are shown in Figures B-1, B-2, and B-3.

1/ An explanation of the NHI demand models and methodologies in part employed for these estimates is found in Cultice, James M., and Cole, Roger B. The Impact of Comprehensive National Health Insurance on Demand for Health Manpower. Bureau of Health Manpower, HRA, DHEW. DHEW Publication No. (HRA) 77-102, July, 1976.

2/ "Review of Health Manpower Population Requirements Standards," DHEW Publication No. (HRA) 77-22, 1976.

The studies of "standards" described above have been grouped according to the method used. The four categories of methods are:

(1) Need-Based studies, which attempt to relate manpower to disease or disability prevalent in the population.

(2) Professional-Opinion Based studies use experts in health care delivery to estimate manpower needed to fulfill the demands of a population for services or care.

(3) Demand on Utilization-Based studies rely on visit rates of a population for specific services or conditions, and then relate visits to estimates of physician productivity.

(4) HMO-Based studies derive requirements for physicians by averageing or taking means of staffing patterns from one or several prepaid group practices.

All of the requirements are translated into physicians per 100,000 population. Each study is reflected in the following figures by a circle or triangle, according to the legend given on the figures. (A few of these points have been adjusted or placed in the figures based on a best estimate within a given "type of study.") None of the requirement points refer to any specific year shown on the top axis. For each specialty, there is also a trend line for the supply ratio, estimated by the Bureau, for the period 1975 through 1990, using the top axis for the reference year.

Primary Care

Figure B-1 shows requirement estimates for internal medicine that range twelve-fold. The lower limits of this wide range reflect the view of those investigators that internists should limit their practices to the more specialized--secondary and tertiary--care. The highest recommended ratio (95 per 100,000) reflects the view of that research that internists and pediatricians should render all primary care, while family medicine and general practice together continue to decline in numbers. The supply projection for future years exceeds all requirements estimates except one, but it must be emphasized again that most of these requirements estimates relate to the early 1970's and the proponents of those estimates may or may not recommend similar ratios through 1990.

Family practice and general practice requirements estimates also have a very wide range--over five-fold. Some of the uncertainty over family practice derives from the lack of concensus as to who should provide most of the primary care. One extreme view would be that physician extenders can fill this role, therefore lowering the requirements for family practice. An opposite view would be that all other specialists gradually give up the primary care content of their practices to family practitioners, thus raising requirements. While family practice is a recognized specialty, there is still some confusion on physician and planning over its content definition as distinct from other specialties.

The supply trend for family practice shows an increasing ratio and number through 1990, but this trend is predicated on maintenance of the present high demand among students for a new specialty, lack of "leakage" out of family practice into more narrow specialties, and continued Federal funding of these young and somewhat financially fragile programs.

Pediatrics--like internal medicine, family practice and general practice--also has a wide range of requirement estimates, again reflecting some uncertainty over the role of physician extenders and also the sharing of patient populations between pediatrics and family practice. Perhaps more than the other primary care specialties, pediatrics offers a broad range of proven preventive services which require physician backup, but not necessarily direct provision.

Obstetrics-gynecology is considered to be a primary care specialty by the Coordinating Council on Medical Education and for the purpose of certain section of PL 94-484. Insofar as it deals with primary care problems, it, too, has some ambiguities with respect to sharing the patient population with other physicians and with physician extenders. To the extent that uncomplicated, normal deliveries may be handled by nurse midwives, the requirements for obstetricians may be reduced. The various requirements estimates for this specialty cluster more than for the other primary care specialties. This may reflect surprising unanimity of opinion or simply mean that very disparate views have not yet gotten into the literature or under the Bureau's surveillance. The projected supply will be close to present supply and also close to--but on the high side of--current literature citations.

Surgeons

Figure B-2 shows requirements estimates for eight of the major surgical fields. Until practice content profiles are developed, it is not possible to state how much overlap there is between and among surgeons in terms of the spectrum of problems with which they deal. In the cases of urology and ophthalmologic surgery, there is probably very little overlap with other surgical specialties, but ophthalmology overlaps considerably with optometry. Otolaryngology overlaps with oral surgery, thoracic surgery, neurosurgery, plastic surgery, orthopedic surgery, general surgery and--in the case of tonsillectomies--there is still an overlap with general practitioners.

The content of surgical training and practice do overlap with the medical specialties historically and of necessity. Every time a surgeon operates on a person with diabetes or a heart problem it is not necessary to have a diabetologist or cardiologist in the operating room. The surgeon must have a general knowledge of common medical problems and their treatment. It may be that this need for cross-specialty information goes deeper for surgeons than for primary care or medical subspecialty physicians and their required depth of knowledge of surgical management.

This point may be important if the future tends to restrict surgeons more to the operating room as "technicians", and they become isolated from office-based practice. Fewer surgeons will be needed under these conditions, but the overall quality of care they delivery would have to be examined closely if they are isolated from primary care and the ambulatory world from which most of their patients come and to which they hope to return after surgery.

The most noteworthy aspect of the surgeon requirement estimates shown in Figure B-2 is that the physician-population ratios are roughly half those charted for the primary care specialties. Surgeon requirements are lower, overall, than nonsurgeon requirements precisely because the events with which they deal are less common in occurrence.

Surgical events are also usually discrete so that the role of the surgeon is more readily definable. This has the potential of making requirements forecasting more uniform. Most methods or models--regardless of data base--relate more closely to needs since it is thought that with the broad coverage for acute hospital care that exists in this country and due to the fact that most surgical conditions have recognizable presenting symptoms, most of the biological need for surgery is being met. These facts and opinions together perhaps explain why the various surgeon requirements studies cluster within a narrower range of ratios than do the primary care requirements estimates discussed earlier.

Opnthalmology is shown in Figure B-2 as a surgical specialty, but only a small percentage of an ophthalmologist's time is spent in surgery. The bulk of their time is spent doing primary vision care including refractions, which are also done by optometrists. Estimating requirements for these two specialties for vision care is most difficult. Perhaps the reservoir of unmet surgical need for an ophthalmologist's services has been underestimated in the past. More consideration must be given to defining the magnitude of unmet need in this specialty through such programs as vision screening and general eye evaluation in the schools.
Otolaryngology is another surgical specialty in which nonsurgical procedures occupy a great deal of time, overlapping with many of the competencies held by primary care physicians. In 1972, forty-one percent of otolaryngologists' operative workload was made up of tonsillectomies. While there has been a 19 percent decrease in the rate for this procedure between 1970 and 1974, the indications for tonsillectomy and rates for the procedure are likely to undergo continued downward revisions. As a result, the requirement estimates from the literature, as shown in Figure B-2, may also be revised downward in future studies.

Psychiatry

Figure B-3 shows the requirements ratios and supply projections for psychiatrists. Psychiatry shows a greater range of requirements estimates than any other specialty. There is little information available on which to evaluate the significance of such a diversity of estimates. Perhaps the breadth of opinions reflects the uncertainty as to how much psychiatric care society believes it needs or can afford. The use of mental health counsellors with masters degree levels of training has not been fully explored yet, nor has the role of psychologists at the Ph.D. level been well specified in these many studies of psychiatry manpower requirements. Organizational changes are being called for in the delivery of mental health and counselling services. These movements are quantitatively difficult to measure in terms of manpower requirements.

Once again, it must be emphasized that Figures B-1 through B-3 represent estimates of requirements gleaned using a variety of assumptions, methodologies from a review of the literature. Each study has unique advantages and limitations. The Bureau of Health Manpower does not endorse or necessarily refute any of these studies.

In addition, the imposition of projected supply figures developed by the Bureau of Health Manpower on the requirements estimates does not imply that supply should be brought any closer to one or any of several requirements estimates. The foregoing discussions pointed out only a few of the limitations of these requirements estimates for use in projecting future requirements. It is currently the function of GMENAC to consider such matters and advise the Secretary on further studies or assessments that need to be made to eventually bring the graduate medical education system into numerical harmony with future physician requirements.

Table B-1. Current supply and predicted requirements for health manpower in 1980, 1985, and 1990: Project SOAR Model (in thousands)

Health manpower	1975 supply	Requirements			
		Range of estimates			1975-1990 percent increase range
		1980	1985	1990	
Total physicians....................	378.5	424.4-427.4	480.0-491.8	542.6-571.1	43-51
M.D.'s...........................	364.5	408.5-411.5	461.9-473.3	521.9-549.5	43-51
D.O.'s...........................	14.0	15.9	18.1-18.5	20.7-21.6	48-54
Optometrists 1/.....................	19.9	22.1	24.0	25.9	30
Podiatrists 1/......................	7.3	9.9	12.8	16.1	121
Pharmacists 1/......................	122.5	144.4	166.4	190.3	55
Veterinarians 1/....................	31.8	41.4	46.3	51.3	61

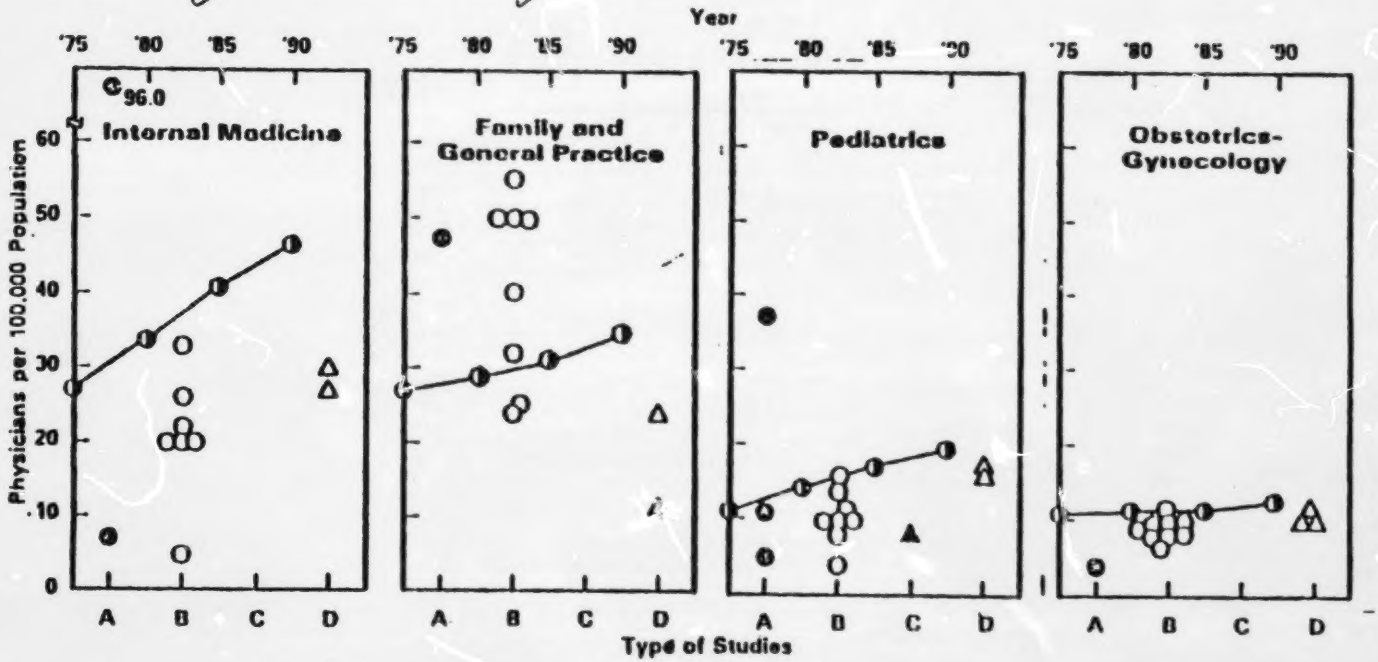
1/ Alternative requirements estimates were not made for optometrists, pharmacists, podiatrists, and veterinarians.

Note: These estimates are provisional and subject to revision before the final draft of this report is prepared. The estimates assume that supply and requirements were in balance in 1975; that price elasticity remains constant; that the trends in non-dollar determinants of health care utilization do not substantially change between 1975 and 1990; and that no care or manpower substitutions occur between manpower types or care categories.

Figure B-1

Selected Studies of Estimates- Physician Supply and Requirements Ratios

PRIMARY CARE—OB/GYN



Legend: Type of Studies

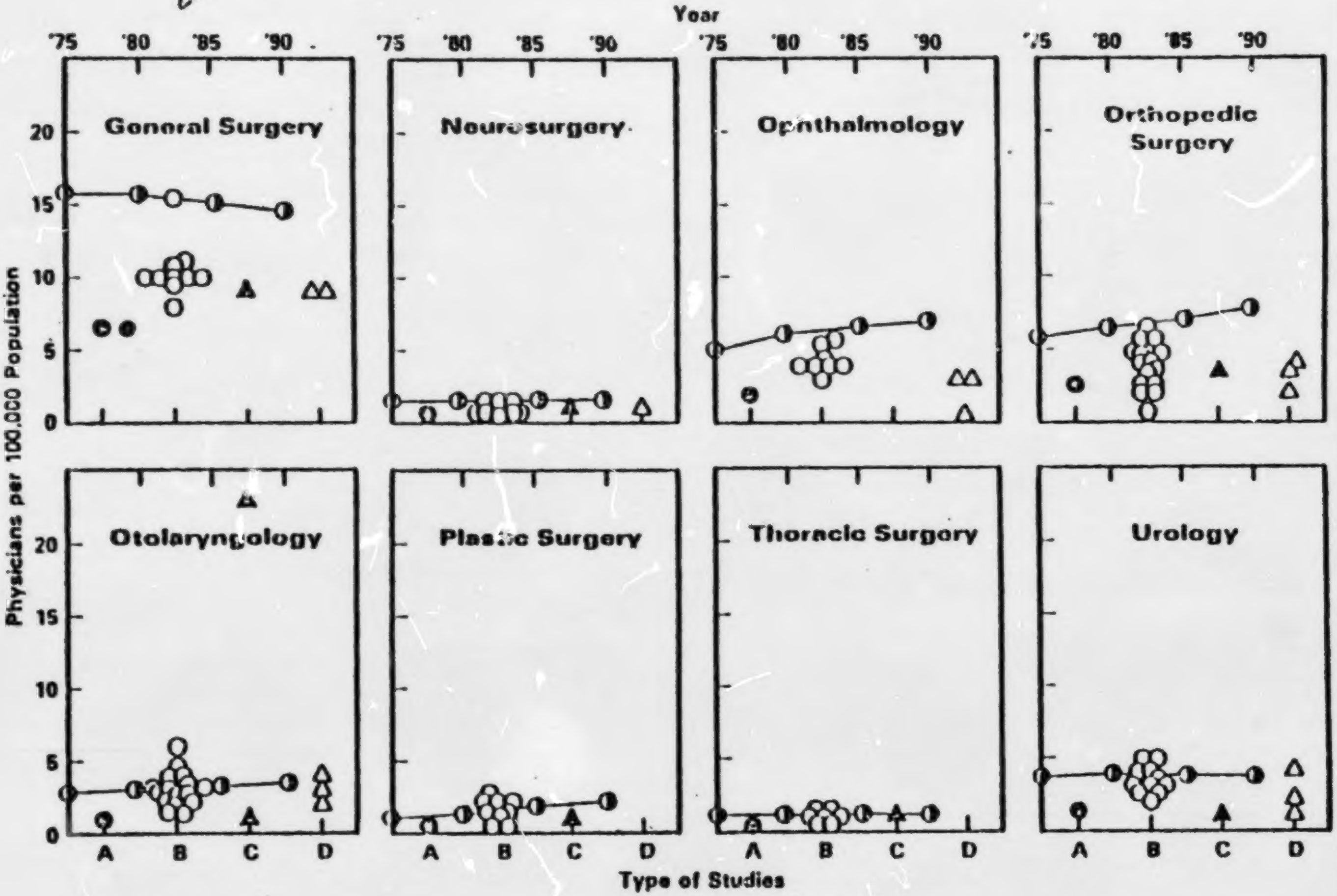
- ◐ A Need-Based Studies
- ○ B Professional Opinion-Based Studies
- ▲ C Demand or Utilization-Based Studies
- △ D HMO-Based Studies
- ◐— Supply-Projected Ratio

Source, Modified from DHEW Publ. No. HRA 77-22, and HRA Contract No. 231-76-0034 (Harvard Medical School)

Figure B-2

Selected Studies of Estimates-Physician Supply and Requirements Ratios

SURGEONS



Legend: Type of Studies

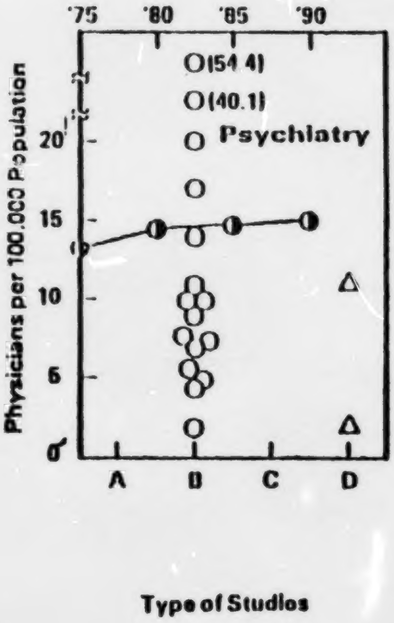
- ● A Need-Based Studies
- ○ B Professional Opinion-Based Studies
- ▲ C Demand or Utilization-Based Studies
- △ D HMO-Based Studies
- ◐— Supply-Projected Ratio

Source: Modified from DHEW Publ. No. HRA 77-22, and HRA Contract No. 231-76-0034 (Harvard Medical School)

Figure B-3

Selected Studies of Estimates-Physician Supply and Requirements Ratios

PSYCHIA...



Legend: Type of Studies

- ● A Need-Based Studies
- O B Professional Opinion-Based Studies
- △ C Demand or Utilization-Based Studies
- △ D HMO-Based Studies
- ◐— Supply-Projected Ratio

SOURCE: Modified from DHEW Publ. No. HRA 77-22, and HRA Contract No. 231-76-0034 (Harvard Medical School)